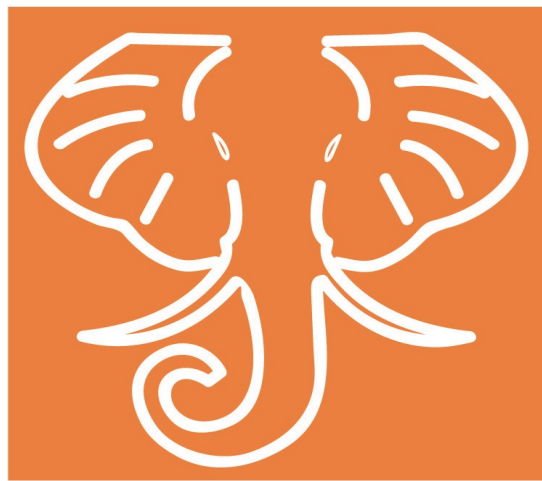


## **Numismatic notes & monographs.**

New York : American Numismatic Society, 1920-

<http://hdl.handle.net/2027/mdp.39015005373827>

# HathiTrust



[www.hathitrust.org](http://www.hathitrust.org)

**Creative Commons Attribution-NonCommercial-ShareAlike**

[http://www.hathitrust.org/access\\_use#cc-by-nc-sa-4.0](http://www.hathitrust.org/access_use#cc-by-nc-sa-4.0)

This work is protected by copyright law (which includes certain exceptions to the rights of the copyright holder that users may make, such as fair use where applicable under U.S. law), but made available under a Creative Commons Attribution-NonCommercial-ShareAlike license. You must attribute this work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work). This work may be copied, distributed, displayed, and performed - and derivative works based upon it - but for non-commercial purposes only (if you are unsure where a use is non-commercial, contact the rights holder for clarification). If you alter, transform, or build upon this work, you may distribute the resulting work only under the same or similar license to this one. Please check the terms of the specific Creative Commons license as indicated at the item level. For details, see the full license deed at <http://creativecommons.org/licenses/by-nc-sa/4.0>.







PROPERTY OF

*The  
University of  
Michigan  
Library*

1817

ARTES SCIENTIA VERITAS













CJ NUMISMATIC NOTES AND MONOGRAPHS

No. 151

# ORICHALCUM AND RELATED ANCIENT ALLOYS

Origin, Composition and Manufacture  
with Special Reference to the  
Coinage of the Roman Empire

By EARLE R. CALEY



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK

1964



# THE AMERICAN NUMISMATIC SOCIETY

*Founded 1858 • Incorporated 1865*

BROADWAY BETWEEN 155TH & 156TH STREETS

NEW YORK 32, N.Y.

**PURPOSES:** The Society was founded for the collection and preservation of coins, medals, decorations and paper money and for the investigation of their history and other subjects connected therewith.

**MEMBERSHIP:** Applications for membership are welcomed from all interested in numismatics. Inquiries regarding membership should be addressed to the Secretary of the Society.

**DUES:** The annual dues for an Associate Membership are \$10.00. Issues of the *Notes and Monographs*, *Museum Notes*, *Hispanic Numismatic Series*, and *Numismatic Literature* are distributed to all members.

**PUBLICATIONS:** The *Numismatic Notes and Monographs* consist of separately issued papers, each on a single topic, of which usually several numbers appear each year. *The American Numismatic Society Museum Notes* is a publication, irregular in appearance, consisting of brief notes and papers, principally on items in the Society's collections. *Numismatic Literature* is a quarterly listing current numismatic publications with abstracts of their content. *Numismatic Studies* is a series which accommodates works of full book length. The *Hispanic Numismatic Series*, published in co-operation with the Hispanic Society of America, consists of publications devoted to the coinage of the Iberian Peninsula, and is based on the collections of the Hispanic Society.

**MUSEUM:** The Society maintains a museum located in uptown Manhattan, New York City, which houses its offices, collections and library. Collections embrace coins of all periods from their inception to modern times, medals and decorations. Selections from its cabinets are on display in an exhibition. The library, consisting of about 18,000 volumes, covers all branches of numismatics.

The Museum is open to Members and the public on Tuesdays, Wednesdays, Thursdays, Fridays and Saturdays. It is closed on Sundays and Mondays and the following holidays: New Year's Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Election Day, Thanksgiving Day and Christmas Day. The hours of the Library are from 9 A.M. to 5 P.M. The public exhibition is open from 10 A.M. to 5 P.M.

# NUMISMATIC NOTES AND MONOGRAPHS

*Number* 151





# Orichalcum and Related Ancient Alloys

Origin, Composition and Manufacture  
with Special Reference to the  
Coinage of the Roman Empire

By EARLE R. CALEY



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK  
1964

QJ  
35  
N9  
nr. 151

**ALL RIGHTS RESERVED BY  
THE AMERICAN NUMISMATIC SOCIETY**

**PRINTED IN GERMANY  
AT J. J. AUGUSTIN · GLÜCKSTADT**

## TABLE OF CONTENTS

I. INTRODUCTION .....	I
II. THE EARLIEST COPPER ALLOYS CONTAINING ZINC .	3
III. THE ORIGIN OF ORICHALCUM .....	13
IV. PREVIOUS ANALYSES OF ORICHALCUM COINS OF THE ROMAN EMPIRE .....	32
V. NEW ANALYSES OF ORICHALCUM COINS .....	45
VI. ANALYSES OF ROMAN COINS COMPOSED OF OTHER ALLOYS CONTAINING ZINC.....	69
VII. COMPOSITION OF THE ORICHALCUM AND ZINC BRONZE SESTERTII AND DUPONDII OF INDIVIDUAL EMPERORS .....	77
VIII. MANUFACTURE OF ORICHALCUM .....	92
IX. VARIOUS ORICHALCUM OBJECTS AND SOME MODERN FORGERIES .....	104





## I. INTRODUCTION

The Greek word *ορείχαλκος* and the corresponding Latin word *orichalcum*, otherwise spelled *aurichalcum*, designated different metals or alloys at different times,<sup>1</sup> but this Latin word and its equivalent in modern languages is now used by numismatists to designate a copper alloy containing zinc which the Romans employed in very late republican times and in imperial times as a material for coins. Some writers on Roman numismatics imply or state that orichalcum was an alloy of fixed composition, but this is not in accord with the facts. At no one time were the proportions of copper and zinc held exactly constant, and with passage of time the proportion of zinc gradually decreased while the proportions of tin and lead, which in the beginning were present in very small amounts as mere impurities, increased to such an extent that one or the other, or both, became important components of the alloy. Hence, in a strict sense, the term orichalcum should be understood to refer not to a single alloy but to a class of alloys that contained copper and zinc as principal components. Though Roman alloys of this class may be called brass, they contain lower proportions of zinc than most varieties of modern brass. Orichalcum is therefore a convenient and distinctive term for designating the particular kind of brass manufactured by the Romans. The complex copper alloys containing zinc, tin, and lead as principal components, used in the third century as materials for coins, should preferably be called zinc bronzes rather than orichalcum when the proportion of zinc is less than the proportion of tin, or when it is less than the proportion of tin and lead taken together.

It is not true, as has sometimes been stated, that orichalcum is the earliest known copper alloy containing zinc. Examples of much earlier

<sup>1</sup> Rossignol, J. P., *Les métaux dans l'antiquité* (Paris, 1863), pp. 205–331, deals in detail with the etymology of these words and their various meanings. The spelling *orichalcum* is definitely to be preferred to *aurichalcum*. For additional etymological information see: Diergart, P., *Zeitschrift für angewandte Chemie*, XIV (1901), pp. 1297–1301; *ibid.*, XV (1902), pp. 761–763; *ibid.*, XVI (1903), pp. 85–88. Disagreement with some of the conclusions of Diergart was expressed by Neumann, B., *Zeitschrift für angewandte Chemie*, XV (1902), pp. 511–516, 1217–1218.

alloys are now known. This study begins with an inquiry as to their place and time of origin, and a discussion of the difference between these alloys and orichalcum as to composition and probable method of manufacture.

The scanty information on the origin and manufacture of orichalcum given by ancient authors has been variously interpreted by modern writers. Often, isolated statements of single authors have been interpreted without regard to the body of information as a whole, and without regard to certain chemical or metallurgical facts. It seemed worthwhile to bring together in one place all the known ancient technical information about orichalcum, and to present some fresh interpretations of its significance.

Many false or misleading statements about the composition of orichalcum, and of orichalcum coins, exist in the literature of numismatics. Some of these statements are the result of the insufficient amount of chemical data available at the time, others the result of failure to make use of the data available, and still others the result of failure to interpret these data correctly. This study contains a critical account of all previous investigations of the composition of orichalcum coins, and presents the results of new and exact analyses of twenty-five such coins. On the basis of both the old and new data the changes in the composition of orichalcum with time of manufacture are traced in detail, and possible reasons for these changes are suggested. An attempt is made to establish the probable date when orichalcum ceased to be manufactured for the Roman coinage, and to determine the probable duration of the period when it was used only as a reworked alloy. The composition of late sestertii and dupondii struck in zinc bronzes or other alloys is discussed, especially from the standpoint of determining when orichalcum ceased entirely to be employed as a material for coins. Some consideration is given to the composition of small orichalcum objects other than coins, and the theory is advanced that coins served as the immediate source of the metal for many of these objects. The possibility of dating illegible orichalcum coins and other orichalcum objects from their chemical composition is also considered. Finally, a comparison is made between the composition of genuine orichalcum and that of a few modern forgeries of ancient objects composed of copper alloys containing zinc.

## II. THE EARLIEST COPPER ALLOYS CONTAINING ZINC

Although the Romans were undoubtedly the first to employ alloys of copper and zinc for coins, it is not true, as has sometimes been asserted, that this was the first use of such alloys for any purpose. Centuries before their use by the Romans for coins, copper alloys containing zinc were sporadically produced and used for the manufacture of a variety of objects. For a proper understanding of the distinctive nature of orichalcum, it is necessary to consider first the composition of these earlier alloys.

The comprehensive researches of Otto and Witter and their co-workers show that copper alloys containing moderate proportions of zinc were occasionally produced even in the Early Bronze Age in Central Europe. Of the more than thirteen hundred metal objects analyzed by these investigators, thirty were found to contain zinc as a component of the alloy.<sup>2</sup> Nine of their analyses of such objects are listed in Table I. These analyses were made by combination of chemical and spectrographic methods. By reason of the stated degree of accuracy of most of the determinations the results are here given only to one decimal place. The twenty-one other objects were analyzed solely by spectrographic methods, and though numerical results were not obtained for the copper content, the zinc content, or both, the analyses showed clearly that significant proportions of zinc were present. It will be seen that only one of the objects listed in Table I was found to contain more than twenty per cent. A low to moderate zinc content is characteristic of very early alloys of copper and zinc. No example has yet been found of such an alloy in which the proportion of zinc reaches a third, the usual proportion in modern yellow brass. It will also be seen from Table I that most of the objects contained tin in low proportions, and that a few of them contained significant proportions of lead. The presence of tin or lead, or both together, in a proportion not much inferior to that of the zinc is frequent in ancient

<sup>2</sup> Otto, H., and Witter, W., *Handbuch der ältesten vorgeschichtlichen Metallurgie in Mitteleuropa* (Leipzig, 1952), pp. 210-211.

copper alloys containing zinc, and sometimes the proportion of tin or lead, or both, considerably exceeds that of the zinc.

TABLE I  
ANALYSES OF EARLY BRONZE AGE METAL OBJECTS OF CENTRAL EUROPE  
CONTAINING ZINC AS A PRINCIPAL COMPONENT OF THE ALLOY

<i>Object No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Other Elements %</i>	<i>Total %</i>
1	75.0	22.6	1.1	0.2	0.1	99.0
2	74.3	16.5	4.8	2.9	1.7	100.2
3	79.3	14.2	4.2	1.6	0.9	100.2
4	84.5	13.9	0.1	0.5	1.0	100.0
5	75.0	12.8	4.0	6.5	1.7	100.0
6	84.5	9.5	4.6	0.1	1.0	99.7
7	85.9	8.5	4.6	0.2	0.7	99.9
8	86.2	8.0	5.0	0.1	0.6	99.9
9	81.9	7.5	6.3	3.4	0.6	99.7

*Descriptions and Notes*

1. Ax with rounded head found at Poppelwitz, Breslau district. Otto-Witter Analysis No. 1355. The other elements were: nickel, 0.02%; silver, 0.01%; arsenic, 0.08%; bismuth, a trace. Analyzed by H. Otto.
2. Dagger blade found at Schraplau, Mansfeld lake district. Otto-Witter Analysis No. 1358. The other elements were: iron, 1.5%; nickel, a trace; silver, 0.01%; arsenic, 0.01%; antimony, 0.01%; bismuth, 0.07%. Analyzed by J. Winkler.
3. Flanged celt found at Bennewitz, Saal district. Otto-Witter Analysis No. 1349. The other elements were: iron, 0.7%; nickel, a trace; silver, 0.04%; arsenic, 0.1%; antimony, 0.04%; bismuth, 0.05%. Analyzed by J. Winkler.
4. Rod found at Zerst. Otto-Witter Analysis No. 1366. The other elements were: iron, 0.2%; nickel, 0.04%; arsenic, 0.5%; antimony, 0.3%; sulfur, a trace. Analyzed by H. Otto.
5. Heeled celt from Finsterwalde. Otto-Witter Analysis No. 1352. The other elements were: iron, 1.3%; silver, 0.08%; arsenic, 0.1%; antimony, 0.1%; bismuth, 0.08%. Analyzed by J. Winkler.
6. Bar found in the Rhine between Ingelheimer and Peteraue. Otto-Witter Analysis No. 1359. The other elements were: iron, 0.03%; nickel, 0.05%; cobalt, a trace; silver, 0.05%; arsenic, 0.1%; bismuth, a trace; sulfur, 0.5%. Analyzed by H. Otto.
7. Bar found at Rettberg Aue near Mainz. Otto-Witter Analysis No. 1361. The other elements were: iron, 0.2%; nickel, 0.06%; cobalt, a trace; silver, 0.05%; gold, a trace; sulfur, 0.3%. Analyzed by H. Otto.

8. Bar found in the Rhine between Ingelheimer and Peteraue. Otto-Witter Analysis No. 1360. The other elements were: iron, 0.2%; nickel, a trace; cobalt, a trace; silver, 0.5%; arsenic, 0.1%; bismuth, a trace; sulfur, 0.3%. Analyzed by H. Otto.
9. Flanged celt found at Bennewitz, Saal district. Otto-Witter Analysis No. 1350. The other elements were: iron, 0.4%; nickel, a trace; silver, 0.04%; arsenic, 0.08%; antimony, 0.03%; bismuth, 0.08%. Analyzed by J. Winkler.

Analyses of various other prehistoric objects composed of copper alloys containing zinc are listed in Table II. At least some of these objects are later in date than those listed in Table I. No. 1 was analyzed by Moss<sup>3</sup> in the course of his investigations of the residues left in metallurgical crucibles used by the crannog dwellers of Ireland. In view of the small weight of metal available for analysis, his results were correctly expressed only to the first decimal place. The style of No. 2, analyzed by Church,<sup>4</sup> clearly indicated a pre-Roman date. Though he expressed his results to two decimal places, they are here given only to one in view of his high summation and his failure to determine certain impurities which must have been present. No. 3 was analyzed by Fellenberg.<sup>5</sup> This investigator found significant proportions of zinc in several other objects, but these appear to belong in the Roman period, though a few may be earlier. No. 4, analyzed by Helm,<sup>6</sup> is notable as containing an unusually high proportion of zinc for an ancient object. The presence of so much bismuth is also very unusual. Though there has been some controversy as to the date of this object, the most probable date appears to be the middle of the La Tène period. No. 5, also analyzed by Helm, is believed to belong to the earlier part of this same period. Nos. 6 to 9, inclusive, analyzed by Bibra,<sup>7</sup> all came from mound graves in the province of Hannover, Germany. Their exact age is uncertain, though they are probably all much earlier than the beginning of the Christian Era.

<sup>3</sup> Moss, R. J., *Proceedings of the Royal Irish Academy*, XXXVII C (1924-1927), p. 186.

<sup>4</sup> Church, A. H., *Journal of the Chemical Society*, XVIII (1865), p. 216.

<sup>5</sup> Fellenberg, L. R. von, *Mitteilungen der Naturforschenden Gesellschaft in Bern* (1863), p. 54.

<sup>6</sup> Helm, O., *Zeitschrift für Ethnologie*, XXVII (1895), pp. 7-8.

<sup>7</sup> Bibra, E. von, *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 122-123.

TABLE II

ANALYSES OF PREHISTORIC METAL OBJECTS OF VARIOUS DATES FROM THE  
BRITISH ISLES AND NORTHERN EUROPE CONTAINING ZINC AS A PRINCIPAL  
COMPONENT OF THE ALLOY

<i>Object No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Other Metals %</i>	<i>Total %</i>
1	78.8	15.5	3.1	0.9	1.9	100.2
2	88.2	9.1	3.6	—	—	100.9
3	80.30	16.31	2.85	0.16	0.38	100.00
4	63.86	30.62	1.13	0.18	4.21	100.00
5	70.71	27.30	1.04	trace	trace	99.05
6	75.70	19.05	3.14	0.88	1.86	99.63
7	82.85	12.87	3.02	0.93	0.33	100.00
8	87.19	9.70	1.01	0.70	1.40	100.00
9	87.05	5.00	7.86	trace	0.09	100.00

*Descriptions and Notes*

1. Small bead from slag in a crucible found in County Galway, Ireland. The other metals were: iron, 0.9%; nickel, 1.0%.
2. Massive bracelet found at Aboyne, Scotland. A similar bracelet from the same locality was found to contain: copper, 86.5%; zinc, 1.4%; tin, 6.8%; lead, 4.4%. The zinc in this one may be considered to be present as a mere impurity.
3. Spiral from an Iron Age grave at Cammin, Germany. The metal was found to contain 0.38% iron.
4. Spoon from the ancient burial ground at Rondsens, Germany. The other metals were: iron, 0.23%; bismuth, 3.98%.
5. Fibula from the ancient burial ground at Rondsens, Germany. A trace of iron was found. The low summation of this analysis may be due to the presence of corrosion products in the sample taken for analysis.
6. Fragment of a large vessel. The other metals were: iron, 0.93%; nickel, 0.93%; antimony, a trace.
7. Fragment of a vessel. The other metals were: iron, 0.33%; nickel, a trace; antimony, a trace.
8. Fragment of a fibula. The other metals were: iron, 1.10%; nickel, 0.30%.
9. Small ornamental shield with ring. The other metals were: iron, a trace; nickel, 0.09%; antimony, a trace.

The earliest known metal objects of the Mediterranean region that contain significant proportions of zinc were found at Gezer in Palestine.<sup>8</sup> In most of these the zinc content is less than four per cent, and

<sup>8</sup> Macalister, R. A. S., *The Excavations of Gezer* (London, 1912), Vol. II, pp. 265, 293, 303. The analyses were made by J. E. Purvis.

could be regarded as a mere accidental impurity. However, one of the objects from this site was found to contain 23.40 per cent of zinc, along with 10.17 per cent of tin and 66.40 per cent of copper. This object, the metal of which may be termed a zinc bronze, is believed to belong to the period known as Semitic III (1400–1000 B.C.). This is by far the earliest known object from the Mediterranean region in which zinc is clearly present as a principal component of the alloy. Moreover, no other object from this region dated prior to the first century B.C. has yet been found in which zinc is present with copper as a principal component of an alloy. Many bronze objects from the intervening period of about a thousand years have been analyzed, but zinc, when present at all, has been found to occur in these as an accidental impurity in proportions seldom exceeding a few tenths of one per cent. Bibra<sup>9</sup> found 2.30 per cent of zinc in a Macedonian bronze coin and 3.72 per cent in a bronze coin of Syracuse, but these are unusually high proportions for Greek bronze of any kind. The highest proportion of zinc found in any Greek bronze coin analyzed by the author and his co-workers was 0.20 per cent, and of a group of eighty such coins there were fifty in which zinc was not detected at all.<sup>10</sup>

The only metal objects that may be classified as Greek and in which zinc has been found to be a principal component of the alloy were found at or near Greek colonies or settlements on the Black Sea. Only four objects of this kind are known. All were analyzed by Bibra.<sup>11</sup> The results of his analyses are listed in Table III. The reason for the perfect summations of all these analyses is that Bibra customarily determined copper by difference, i.e., by subtracting the total of all other determinations from 100.00 per cent in order to find the percentage of copper. On the basis of archaeological evidence all these objects are of late B.C. date. Nos. 1 and 2 are believed to belong in the first century B.C. Nos. 3 and 4 are dated before the beginning of the Christian Era, and probably also belong in the first century B.C. However, there is some possibility that the actual date of manufacture of some or all of these objects may be a little earlier than the first

<sup>9</sup> Bibra, E. von, op.cit., pp. 86–87.

<sup>10</sup> Caley, E. R., *The Composition of Ancient Greek Bronze Coins* (Philadelphia, 1939), p. 151.

<sup>11</sup> Bibra, E. von, op.cit., pp. 98–99, 102–103.



century. It will be seen that small proportions of tin are present in Nos. 1 and 2 along with the zinc. In this respect their composition resembles that of some of the prehistoric objects listed in Tables I and II. But the composition of Nos. 3 and 4 does not, since they are free from tin and contain very little lead. In being composed essentially of copper and zinc alone, the alloys of which these objects were made resemble the early type of orichalcum used by the Romans for coinage. They differ, however, in containing much lower proportions of zinc.

TABLE III

ANALYSES OF PRE-ROMAN METAL OBJECTS FROM SITES ON THE NORTHERN SIDE OF THE BLACK SEA CONTAINING ZINC AS A PRINCIPAL COMPONENT OF THE ALLOY

<i>Object No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Other Metals %</i>	<i>Total %</i>
1	82.76	13.31	3.40	0.19	0.34	100.00
2	84.87	10.12	4.36	0.21	0.44	100.00
3	91.00	9.00	none	trace	traces	100.00
4	90.59	8.10	none	trace	1.31	100.00

*Descriptions and Notes*

1. Fishhook from a Greek grave on the Crimea. The other metals were: iron, a trace; nickel, 0.34%.
2. Fishhook from a Greek grave on the Crimea. The other metals were: iron, a trace; nickel, 0.44%; cobalt, a trace.
3. Ring made of fine twisted wire from the ruins of ancient Tanaïs. The other metals were: iron, a trace; nickel, a trace; antimony, a trace.
4. Wire from a grave in the vicinity of ancient Olbia. The other metals were: iron, 1.31%; antimony, a trace.

The first known use of alloys of copper and zinc for coinage occurred in the late Roman Republican period, apparently just after the middle of the first century B.C. This conclusion is based chiefly on the four analyses listed in Table IV. These analyses were published by Bahrfeldt,<sup>12</sup> who does not name the analyst. The figures given by Bahrfeldt indicate that only copper and zinc were determined, though the deficiencies in the summations of three of the analyses show that certain impurities, such as tin, lead, or iron, were also present. How-

<sup>12</sup> Bahrfeldt, M., *Numismatische Zeitschrift*, XXVII (1905), p. 42.

ever, since each of these deficiencies amounts to little more than one per cent, the individual proportions of the various other metals present as impurities in these coins must have been small. These four analyses are clearly very important from the standpoint of numismatic history, for they establish the time of the introduction of orichalcum as a coinage metal. They are the only quantitative chemical analyses that have been made of orichalcum coins issued before the reign of Augustus. However, one coin of the late Roman Republican period has been shown by a spectrographic test to consist chiefly of copper and zinc, the proportion of zinc being estimated to be in the range 10–15%. This coin was issued in Macedonia in 44 B.C., possibly by the quaestor, Acilius.<sup>13</sup> Slightly later coins, issued by Sosius at Zacynthus in 37 B.C., are said to be composed of orichalcum, and it has been suggested that a few other moneyers of the very late Republican period may also have issued coins in orichalcum, though decisive evidence based on chemical or spectrographic tests appears to be lacking.<sup>14</sup> On the other hand, such tests have clearly shown that a few types of late Republican or early Imperial coins, erroneously classed as orichalcum coins because of their color, are in fact composed of ordinary tin bronze or leaded tin bronze.

TABLE IV

ANALYSES OF ORICHALCUM COINS OF THE ROMAN REPUBLIC

<i>Coin No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Total %</i>
1	71.11	28.88	99.99
2	71.10	27.60	98.70
3	78.60	20.30	98.90
4	83.84	15.00	98.84

*Identifications*

- 1, 2. Coins of C. Clovius, 45 B.C.  
3, 4. Coins of Q. Oppius, 32–31 B.C.

Grant (*From Imperium to Auctoritas*, Cambridge, 1946, pp. 11, 63) is of the opinion that the coins of C. Clovius were issued in Cisalpine Gaul, probably at its capital, Mediolanum, and that those of Q. Oppius were

<sup>13</sup> Grant, M., *From Imperium to Auctoritas* (Cambridge, 1946), pp. 17, 18, 89, 493.

<sup>14</sup> Grant, M., *op.cit.*, pp. 40, 89.

issued in Syria, probably at Antioch and perhaps also at Apamea or Laodicea.

The copper alloys containing zinc, which appeared before orichalcum was regularly used for coinage by the Romans, differ in various respects from this Roman alloy. Their zinc content varies over a wide range, in the prehistoric alloys especially, as is shown by the data in Tables I and II. Moreover, as is shown in Table V, these earlier alloys contain higher proportions of metals other than copper and zinc. Especially significant are the higher proportions of tin and lead, which are present only in slight proportion as impurities in the orichalcum first used as a coinage metal by the Romans. Another important difference is the sporadic occurrence in respect both to place and time of objects composed of these earlier alloys, and their great scarcity as compared to objects of similar age composed of tin bronze. In contrast, orichalcum coins were regularly produced in a few localities in enormous numbers for nearly two centuries beginning with the time of Augustus. All these differences indicate that the earlier alloys were produced accidentally and that orichalcum was intentionally manufactured. A possible exception may be some of the copper-zinc alloys produced in the vicinity of the Black Sea, as seems to be indicated by the composition of the objects numbered 3 and 4 in Table III.

TABLE V  
TOTAL PROPORTION OF ELEMENTS OTHER  
THAN COPPER AND ZINC

<i>Group No.</i>	<i>Kind and Source of Objects</i>	<i>Source of Data</i>	<i>Other Elements, % Maximum Average</i>	
I.	Early Bronze Age, Central Europe	Table I	12.2	6.5
II.	Prehistoric, British Isles and Northern Europe	Table II	8.0	4.5
III.	Greek, Northern Black Sea Coast	Table III	5.0	2.6
IV.	Orichalcum Coins, Roman Republic	Table IV	1.3	0.9
V.	Orichalcum Coins, Roman Empire, B.C. Period	Table XVII	1.2	1.0

These differences also indicate that the prehistoric alloys were produced by a somewhat different process than the one used for the manufacture of orichalcum. They could not have been made by the direct alloying of copper and zinc, as in modern practice, since metallic zinc could not have been produced in the open crucibles, crude furnaces, or primitive hearths used for smelting in prehistoric times. The metallurgy of zinc is peculiar in that the temperatures required to reduce its minerals or ores to metal with carbon are close to the boiling point of the metal itself, so that it vaporizes away as soon as it is formed unless some means is employed to condense or otherwise trap it. Furthermore, unless air is excluded, the vaporized metal burns immediately to its oxide at these elevated temperatures. Nor could these earlier alloys have been produced by the reduction of a mixture of copper and zinc ores, or a single ore containing both copper and zinc minerals. Bronze may be easily produced by an analogous process in primitive apparatus from a mixture of copper and tin ores, but brass cannot be produced by this general method for making alloys because a temperature high enough to reduce the copper and zinc ores would also be high enough to vaporize and oxidize practically all the zinc before it could alloy with any copper formed by reduction. However, under certain conditions copper containing a low percentage of zinc may sometimes have been accidentally made. If a heterogeneous mixture of the two ores and charcoal were unevenly heated in a crucible some copper might have been formed by reduction before all the zinc ore was reduced. Some of the zinc from the reduction of the remaining zinc ore might then have been trapped by the metallic copper before it could vaporize. This is one way to account for the presence of the low proportions of zinc that not infrequently occur as an impurity in prehistoric copper. More than a few per cent could not have been introduced into copper by this means.

The formation of a copper-zinc alloy by cementation appears to be the only way by which the prehistoric alloys were produced. In this method, as it was carried out in early modern times, thin bars or small pieces of copper are buried in a mixture of zinc ore and charcoal contained in a crucible. On heating the crucible and its charge to a sufficiently high temperature some of the zinc formed by reduction is vaporized and lost but most of it is trapped in the hot surface of the

copper to form a copper-zinc alloy. By the subsequent fusion of the metal, and by stirring, a homogeneous alloy is produced. This was the method employed for making brass in early modern times, and in some places it was used long after metallic zinc became generally available for making brass by direct alloying. In prehistoric times the production of a copper-zinc alloy in this way was in all probability the accidental result of one of the processes then commonly used for the manufacture of bronze. In this process crude copper obtained by the reduction of a copper ore with charcoal, or even wood, was heated with a mixture of tin ore and fuel.<sup>15</sup> The tin formed by the reduction of the tin ore alloyed with the copper, and by fusion and stirring a homogeneous alloy was produced. Probably the prehistoric bronze makers at the period when this process was in use did not even recognize that tin was formed as a separate metal, but believed rather that the process was one in which the crude copper was improved in quality by being treated in this way. In the early development of the process various minerals and ores were in all probability tried before tin ore, in the form of cassiterite or tinstone, was found to be the one that gave the best results. Even after this became well known it is probable that other ores were tried as substitutes or extenders when tin ore became unavailable or scarce. Moreover, the superficial resemblance of some other ores to tin ore may have caused them to be used unintentionally.<sup>16</sup> Thus it came about that at various places and times some of the easily reduced ores of zinc and lead were sometimes substituted for tin ore to a greater or lesser extent with the result that the alloy obtained by this process contained tin, zinc, and lead in various combinations and in a wide range of random proportions. As shown in Tables I and II this is just what the analyses show for prehistoric copper alloys that contain zinc as a component. Moreover, the variety and proportions of the various minor components or impurities in these alloys indicate clearly the use of many different kinds of ores.

<sup>15</sup> Forbes, R. J., *Metallurgy in Antiquity* (Leiden, 1950), p. 250.

<sup>16</sup> Prehistoric miners and metallurgists probably experienced great difficulty in distinguishing clearly certain of the dark-colored ores from each other. For example, tinstone and zinc blende sometimes resemble each other closely in both color and luster. No such difficulty was experienced, however, in recognizing the oxidized ores of copper which they used for bronze manufacture since these have a very striking blue or green color.

### III. THE ORIGIN OF ORICHALCUM

Any inquiry into the origin and technology of orichalcum must involve the question of whether ancient metallurgists ever produced metallic zinc, and if so, whether they recognized it as a distinct metal. Though the discovery of ancient objects composed of zinc has at various times been reported by archaeologists, the stated identification as zinc appears often to have depended on physical appearance rather than on chemical analysis. The earliest such report was by Grignon,<sup>17</sup> who examined a piece of metal found at a Roman site between St. Dizier and Joinville in France and concluded that it was worked zinc. But his reasons for this identification are vague, and probably no reliable chemical tests were made, if indeed they could have been made at such an early date. Salzman<sup>18</sup> reported that certain bracelets found at the ancient necropolis of Kameiros on the Island of Rhodes were formed of hollow silver filled with zinc. He does not state that chemical tests were made, and the possibility exists that he may have based his identification on the grey crystalline appearance of internally corroded silver. Moser<sup>19</sup> reported that an ancient bell-shaped object covered with a mottled bluish-grey and yellowish-brown patina, found in excavations at Castelvenere near Trieste, was composed of zinc or a zinc-antimony alloy. He also fails to state that any chemical tests were made, and the uncertainty of his identification seems to indicate that he depended solely on the appearance of the patina. A few other vague or uncertain identifications have been reported.

Helm<sup>20</sup> was the first to show clearly by chemical analysis that an ancient metal object was composed mostly of zinc. This object, described by him as being a prehistoric Dacian idol, is stated to have

<sup>17</sup> Grignon, P. C., *Bulletin des fouilles d'une ville romaine* (Bar-le-Duc, 1774), p. 11.

<sup>18</sup> Salzman, A., *Revue archeologique*, IV (1861), p. 472.

<sup>19</sup> Moser, L. K., *Mitteilungen der anthropologischen Gesellschaft in Wien*, XXXV (1905), "Sitzungsberichte," p. 52.

<sup>20</sup> Helm, O., *Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (1895), p. 621.

been found at Tordos in Transylvania. It was covered with a bluish-grey layer of corrosion products. On testing the object with a file the metal was seen to be white. Helm at first thought that the metal was antimony, but he found on analysis that a sample of it had the following composition:

<i>Metal</i>	<i>%</i>
Zinc .....	87.52
Lead .....	11.41
Iron .....	1.07

On the basis of these results Helm concluded that the metal was crude zinc. He sent a sample to the famous anthropologist, Virchow, who, because of the apparent historical importance of the identification, had the sample examined independently by another chemist. This chemist found that the sample was not a uniform alloy, as the results obtained by Helm would seem to indicate, but was composed of two layers soldered or welded together, the one being zinc and the other lead. However, the essential fact was confirmed that metallic zinc was the principal component. In his criticisms of the conclusions of Helm, Virchow<sup>21</sup> pointed out that the object had not been found under the controlled conditions of archaeological excavation, but was evidently a surface find, and that therefore its real place of origin and its actual date were unknown. He even questioned the authenticity of the object, though Helm had previously stated that fraud or forgery was out of the question. Virchow concluded that there was no evidence to show that it was a prehistoric Dacian object, though he admitted that it could have been made in Dacia during the Roman period. In a later paper, Helm<sup>22</sup> announced that he had identified another ancient Dacian object as being composed mostly of zinc. This object, from a private collection of antiquities, was an elongated lump of corroded metal with an iron wire imbedded in it, which seemed to indicate that it might have been the clapper of a bell. Unfortunately, the provenance of this object was also uncertain.

The only ancient specimen of definitely known provenance identified beyond doubt as metallic zinc was found in the course of the

<sup>21</sup> Virchow, R., *Zeitschrift für Ethnologie*, XXVIII (1896), pp. 338–339.

<sup>22</sup> Helm, O., *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte*, XXX (1899), p. 100.

excavation of the Agora at Athens.<sup>23</sup> As to provenance, the discoverer, Dr. Arthur W. Parsons, reported as follows: "The fragment of zinc was found in Section OA on May 13, 1939, at the base of the cliff on the north slope of the Acropolis, at a point about 7.0 meters east of the ancient fountain house, the Klepsydra, and directly below the cave sanctuary of Pan. The pottery and coins with which it was found were chiefly of the 4th and 3rd centuries B.C.; there was nothing later than the 2nd century B.C. It may be regarded as certain that the zinc got there no later."

The fragment was in the form of a piece of flat sheet, roughly rectangular in shape, and measuring about 65 by 40 mm. Most of it was 0.50 to 0.55 mm. thick, but it was very thin at the edges. A few pits penetrated right through the piece. The fragment was at first supposed to be composed of lead, and it was not until after it has been drastically cleaned to see if it bore an inscription that qualitative tests were made that revealed that it was composed mostly of zinc. Half of the fragment was sent to the Research Laboratory of the New Jersey Zinc Company for quantitative spectrographic analysis. The following results were reported for the principal metallic impurities present:

<i>Metal</i>	<i>%</i>
Lead .....	1.3
Cadmium .....	0.060
Iron .....	0.016
Copper .....	0.0055

Smaller proportions or traces of magnesium, manganese, antimony, tin, and silver were also found. This is a greater variety of impurities than is present in modern zinc, but the proportion of lead is less than in some grades of modern zinc, and the proportions of cadmium and iron are no higher.

A metallographic examination of a sample of the fragment showed that the metal had the structure of slightly worked zinc, but not the structure of sheet zinc formed by the modern method of rolling. Metal of the structure observed could have been formed by hammering out a lump of cast zinc not more than ten times thicker than the fragment.

<sup>23</sup> Farnsworth, M., Smith, C. S., and Rodda, J. L., *Hesperia*, Supplement VIII (1949), pp. 126-129.



The puzzling feature about this fragment is its survival in such a location for so long a period. Concerning this, Farnsworth, Smith, and Rodda state: "While it is hard to believe that a sample of a reactive metal like zinc would not disappear by corrosion in much less than 2000 years in a location damp enough to cause severe corrosion of adjacent bronze coins, the spectrographic and metallographic analyses agree in showing that the present sample is unlike modern zinc in both composition and method of working, and support the archaeological evidence of its antiquity." However, they suggest that this fragment of zinc had a protective surface layer or a coating that retarded its corrosion. Unfortunately, the opportunity of demonstrating the presence of such a layer or coating and of ascertaining its nature was lost because the fragment was so drastically cleaned before its unique nature was recognized.

Because of the chemical reactivity of the metal, the great scarcity of ancient zinc objects might conceivably be ascribed to their general disappearance through corrosion. However, if metallic zinc really had been abundant and in general use in Greek and Roman times, it seems likely that many zinc objects, particularly those of thick metal, would have survived in protected locations. Perhaps the strongest argument against the abundance or general use of metallic zinc in classical antiquity is the moderately low zinc content of copper-zinc alloys that have survived from that period. In not one of the considerable number of objects composed of such alloys that have been analyzed does the zinc content reach forty per cent, and generally it is much lower. Such a low limit to the zinc content of these alloys indicates that they were made by a cementation process and not by the direct alloying of the two metals. If metallic zinc had been generally available for alloying with copper, it is highly probable that ancient metallurgists would have manufactured some alloys of higher zinc content and that some objects composed of such alloys would have survived.

In general, the archaeological evidence shows that metallic zinc was extremely scarce in classical antiquity. Probably it was only accidentally and occasionally made in very small amounts in a few places in the course of certain metallurgical operations, probably in much the same way as zinc was first accidentally isolated in small

amounts in certain metallurgical operations in Europe in early modern times. According to Rickard<sup>24</sup> the metal was not recognized in modern Europe until 1509 when it was detected in the form of beads or drops in slag at the silver-smelting works on the Rammelsberg in Germany. A little later it was found in small amounts as metal condensed in cracks or crevices in the walls of certain smelting furnaces.<sup>25</sup> In view of the composition of the primary ore worked for silver in the famous Greek mining district of Laurion in ancient times, it seems very likely that zinc was sometimes isolated in the slag or smelting furnaces during the long period when these mines were worked. This Laurion ore is a mixture of the sulfides of iron, lead, and zinc.<sup>26</sup> The silver is contained in the lead sulfide (galena) and the ancient Greeks isolated this from the mixture of sulfides by a sorting and washing process before the actual smelting.<sup>27</sup> However, it is likely that this separation was often imperfect and that some zinc sulfide (sphalerite) was included in the refined ore smelted for silver. In fact, there is evidence for this in a statement by Pliny<sup>28</sup> who says that a product called *lauriotis*, evidently a form of zinc oxide named after the mining district at Laurion, was formed in silver furnaces. In another place<sup>29</sup> he remarks that *cadmea* unquestionably occurs in furnaces used for silver smelting. This term, when applied to an artificial product, undoubtedly designated zinc oxide formed on the walls of smelting furnaces.<sup>30</sup> From other remarks made by Pliny<sup>31</sup> it may be inferred that the size and design of these furnaces were such that considerable quantities of zinc oxide and other useful volatile products collected on their walls and in their chambers. This makes it seem even more likely that small amounts of metallic zinc sometimes condensed in cracks or crevices of the walls of these furnaces.

<sup>24</sup> Rickard, T. A., *Man and Metals* (New York, 1932), Vol. I, p. 158.

<sup>25</sup> Lohneys, G. E., *Bericht vom Bergwercken* (Zellerfeldt, 1617), pp. 83–84.

<sup>26</sup> Marinos, G. P., and Petrascheck, W. E., *Laurion* (Athens, 1956), pp. 232–233.

<sup>27</sup> Some of the ancient sorting and washing basins and tables have remained essentially intact at Laurion up to the present time.

<sup>28</sup> *Natural History*, Book XXXIV, sec. 132.

<sup>29</sup> *Natural History*, Book XXXIV, sec. 100.

<sup>30</sup> Bailey, K. C., *The Elder Pliny's Chapters on Chemical Subjects* (London, 1929–1932), Part II, pp. 166–167.

<sup>31</sup> *Natural History*, Book XXXIV, secs. 101–102.

The great scarcity of metallic zinc in classical antiquity is also indicated by the scarcity of information about it in the works of the writers of that period. Only two passages, both by Greek authors, can be interpreted as referring to the isolation of zinc, and one of these is apparently a fairly close quotation of the other. The original passage occurred in the *Philippica* of Theopompus, a historian of the fourth century B.C., but its occurrence in this work is known to us only through quotations of it or references to it in the works of much later writers. It is, for example, quoted by Stephen of Byzantium, a writer of the sixth century A.D. in one of the surviving fragments of his *Geographical Lexicon*.<sup>32</sup> This writer also indicates that an earlier quotation of it is given by Strabo in his *Geography*, which was written about the beginning of the Christian Era. Strabo, himself, does not state or even hint that he quoted from Theopompus, but a comparison of the two quotations clearly shows that he did. The quotation by Strabo<sup>33</sup> may be closer to the original, for he was much nearer to Theopompus in time of writing and probably used an earlier manuscript of the *Philippica* than was available to Stephen of Byzantium. The text of the pertinent part of the passage in Strabo is as follows: ἔστι δὲ λίθος περὶ τὰ Ἀνδείρα ὃς καίόμενος σίδηρος γίνεται· εἶτα μετὰ γῆς τινὸς καμινευθεὶς ἀποσπάσει ψευδάργυρον, ἣ προσλαβοῦσα χαλκὸν τὸ καλούμενον γίνεται κράμα, ὃ τινες ὀρείχαλκον καλοῦσι.

Although the language of this text is fairly clear, its meaning from the metallurgical standpoint is rather obscure, and chiefly for this reason it has been translated and interpreted in various ways. Some scholars have even altered the standard text of the passage in order to improve its sense, but without sound justification. The following is a close translation: There is a stone near Andeira which yields iron when burnt. After being treated in a furnace with a certain earth it yields drops of false silver. This, added to copper, forms the so-called mixture, which some call *oreichalkos*.

This passage is obviously a sketchy account of a metallurgical process by which a copper alloy called *oreichalkos* was produced. At

<sup>32</sup> For the text of this quotation see: Grenfell, B. P., and Hunt, A. S., *Hellenica Oxyrhynchia cum Theopompi et Cratippi Fragmentis* (Oxford, 1909), *Philippica*, Book XIII, sec. 109.

<sup>33</sup> *Geography*, Book XIII, sec. 56.

the time of Strabo there seems to be no question that the Greek *ορείχαλκος* was the equivalent of the Latin *orichalcum* and that both meant an alloy of copper and zinc. Hence it would seem evident that the Greek *ψευδάργυρος* (false silver) must be metallic zinc. Most scholars have concluded that this was the process, or one of the processes, in use for the production of orichalcum around the beginning of the Christian Era. What they have overlooked, however, is the strong probability that Strabo has here quoted blindly from Theopompus and that he had no first-hand knowledge of this process, which may not have even been in use in his day. It is almost certain that Strabo never traveled in the part of Asia Minor where Andeira was located.<sup>34</sup> On this basis alone, he could not have had a first-hand knowledge of the process. Moreover, he gives no indication anywhere in his *Geography* that he possessed any understanding of metallurgy. Hence this passage does not constitute evidence that orichalcum was made by the direct alloying of copper and zinc at the time of Strabo. It would seem rather to indicate that the alloy was made in this way at the time of Theopompus or earlier, and that the Greek word *ορείχαλκος* also meant an alloy of copper and zinc at this earlier period in spite of the lack of archaeological evidence that brass was known to the Greeks in the fourth century B.C. or earlier.

Various Greek writers, some earlier and some later than Theopompus, mention *ορείχαλκος* as a particular metal or alloy, usually in a way that indicates that it was one of considerable rarity and value. The earliest such mention is in the anonymous *Shield of Herakles*,<sup>35</sup> almost certainly composed prior to 500 B.C., in which the poet says,<sup>36</sup> ὦ εἰπὼν κνημίδας ορείχαλκιο φαεινοῦ Ἥφαιστος κλυτὰ δῶρα, περὶ κνήμησιν ἔθηκεν. (So he spoke, and placed about his legs his greaves of shining *oreichalkos*, the glorious gift of Hephaistos.) Somewhat later is a passage in one of the Homeric hymns to Aphrodite<sup>37</sup> in which the anonymous poet relates that the Hours attached to the ears of the goddess an ornament of precious gold and orichalcum. The text<sup>38</sup>

<sup>34</sup> Leaf, W., *Strabo on the Troad* (Cambridge, 1923), pp. xxviii–xxxviii.

<sup>35</sup> Usually included in editions of the works of Hesiod.

<sup>36</sup> v. 121–122.

<sup>37</sup> VI, v. 8, 9.

<sup>38</sup> According to Allen, T. W., Halliday, W. R., and Sikes, E. E., *The Homeric Hymns* (Oxford, 1936), p. 73.

reads in part: καλήν χρυσεῖην, ἐν δὲ τρητοῖσι λοβοῖσιν ἀνθεμ' ὀρειχάλκου χρυσοῖό τε τιμήντος. Plato in his *Critias*, probably written near the middle of the fourth century, refers to the metal in several passages<sup>39</sup> in his description of the mythical island of Atlantis. In describing the walls around the capital he says: τοῦ δ' ἐντὸς καττιτέρω περιέτηκον, τὸν δὲ περὶ αὐτὴν τὴν ἀκρόπολιν ὀρειχάλκῳ μαρμαρυγᾶς ἔχοντι πυρώδεις. (They covered the interior wall with fused tin, and the wall around the acropolis itself with *oreichalkos*, which has a fiery resplendence.) As to the temple of Poseidon on the Acropolis he relates that: Πάντα δὲ ἔξωθεν περιήλειψαν τὸν νεῶν ἀργύρῳ, πλὴν τῶν ἀκρωτηρίων, τὰ δὲ ἀκρωτήρια χρυσῶ· τὰ δ' ἐντὸς, τὴν μὲν ὀροφήν ἐλεφαντίνην ἰδεῖν πᾶσαν χρυσῶ καὶ ἀργύρῳ καὶ ὀρειχάλκῳ πεποικιλμένην, τὰ δὲ ἄλλα πάντα τῶν τοίχων τε καὶ κιόνων καὶ ἐδάφους ὀρειχάλκῳ περιέλαβον. (All the outside of the temple, except the pinnacles, they covered with silver, but the pinnacles with gold. As to the interior, the roof was covered entirely with ivory variegated with gold, silver and *oreichalkos*. All the rest, the walls, columns and pavement they ornamented with *oreichalkos*.) Further on he relates that the laws of the first kings were engraved on a column of this metal: ἐν στήλῃ γεγραμμένα ὀρειχαλκίνη. In his discussion of the metals available to the inhabitants of Atlantis, Plato states that, except for gold, *oreichalkos* was the most precious metal which existed at that time: πλὴν χρυσοῦ τιμιώτατον ἐν τοῖς τότε ὄν.

Since it is listed along with gold and silver as a metal of great value, it might reasonably be concluded that the *oreichalkos* of these writers could not have been brass. But if zinc was very scarce at this period, as the archaeological evidence appears to indicate, and if the alloy was made in the way Theopompus states, then brass would have been so rare that it could have had a value above that of silver, which, at that time, was being obtained in abundance from the mines of Laurion. Rossignol<sup>40</sup> advanced the theory that the *oreichalkos* of these early Greek writers was a mythical metal that had no real existence, an invention of the poets. He based this theory in part on another statement made by Plato in his *Critias*, where Plato says that *oreichalkos* was something now known only by name, but formerly was something

<sup>39</sup> Secs. 114 e, 116 b, d, 119, c-d.

<sup>40</sup> Rossignol, J. P., *Les métaux dans l'antiquité* (Paris, 1863), pp. 214-236.

more than a name: καὶ τὸ νῦν ὀνομαζόμενον μόνον τότε δὲ πλέον ὀνόματος ἦν. But this statement may mean merely that the alloy was not in use at the particular time when Plato wrote, or that it was in use without Plato being aware of it. Possibly he was not aware of it because it was no longer used locally.

The exact nature of the metallurgical process so briefly described by Theopompus has been the subject of much controversy, and has almost invariably been treated as though the account was original with Strabo. However, the question of its true authorship does not affect the problem of its interpretation from the metallurgical standpoint. This problem may conveniently be discussed by a systematic examination of the meaning of the words, phrases and sentences of the account. The translation previously given will be used as a basis, but any additional or alternate meaning conveyed by the Greek text will also be considered.

"There is a stone near Andeira which yields iron when burnt." The Greek word λίθος, here translated as stone, had a much broader meaning than is indicated by this usual English equivalent, for it included any hard substance of mineral origin. Here the context clearly shows that some metallic mineral or ore is meant. Andeira was the name of a town in northwestern Asia Minor, but its exact site is unknown.<sup>41</sup> Any correlation of its location with known mineral deposits or ancient mining sites is therefore impossible. The verb here translated as burnt might perhaps be better translated as smelted since it seems probable that the process involved the reduction of some mineral or ore that contained iron, although the suggestion has been made that it was a simple roasting process which yielded a product that merely had the superficial appearance of iron,<sup>42</sup> the basis of this suggestion being that no reducing agent is mentioned. However, the metallurgists of the period could recognize iron with certainty since this metal was being regularly produced on a considerable scale. Hence reduction must have been one of the steps in the process. Very likely the need for mixing the ore with charcoal in order to obtain iron in a smelting operation is not explicitly mentioned be-

<sup>41</sup> Leaf, W., *Strabo on the Troad* (Cambridge, 1923), pp. 284-287.

<sup>42</sup> Helm, O., *Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (1895), pp. 622-623.

cause this was such a common practice. However, it seems almost certain, from the kind of ore that was apparently used, that the first step in the whole process was the roasting of the ore, and that no reducing agent was added in this step. The identity of this ore is not entirely certain, though the remainder of the account would seem to indicate that it was one that contained zinc as well as iron. The only common ore that meets this requirement is zinc blende, impure zinc sulfide, which usually contains a considerable proportion of iron. Diergart<sup>43</sup> was of the opinion that zinc blende was unlikely because no mention is made of the choking sulfur dioxide fumes that would have resulted from roasting or smelting it. However, the writer of the account may not have been aware of this, or may simply have not considered it worth mentioning. A roasting operation would have been necessary as a first step in order to convert zinc blende to a form suitable for reduction, i.e., to a mixture of iron and zinc oxides. If a reducing agent were then added and the smelting done without special apparatus or precautions, the zinc would have been lost and only iron would have been obtained. In other words, if this stone found in the vicinity of Andeira was smelted in the ordinary way only iron could be obtained from it. But the writer of the account apparently goes on to state how a second metal could be obtained from this same ore by a special treatment. However, an alternate interpretation is that the stone was a simple iron ore and that the second metal was obtained only because a different ore was added in the second step.

"After being treated in a furnace with a certain earth it yields drops of false silver." The identity of the earth with which the roasted ore was treated has been the subject of controversy. The Greek word γῆ included any kind of friable or soft material that occurred in the ground, or any artificial product of this sort obtained by treating mineral substances in various ways. Here it would appear to be a natural product. Both Rossignol<sup>44</sup> and Diergart<sup>45</sup> suggested that it was a flux of some kind. Helm<sup>46</sup> suggested that it was ordinary coal or

<sup>43</sup> Diergart, P., *Journal für praktische Chemie*, CLXXV (1903), pp. 326-334, 429-432.

<sup>44</sup> Rossignol, J. P., *Les métaux dans l'antiquité* (Paris, 1863), p. 253.

<sup>45</sup> Diergart, P., *Journal für praktische Chemie*, CLXXIV (1902), p. 343.

<sup>46</sup> Helm, O., *Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (1895), p. 623.

an earthy coal which acted as a reducing agent, and Leaf<sup>47</sup> identified it as lignite, but Diergart<sup>48</sup> regarded such identifications as doubtful because he believed that any form of coal would have been designated by its usual generic name. Moreover, no reducing agent for obtaining iron from the ore is mentioned in the first step of the process, and it seems likely that the use of a reducing agent is also implicit here. If the stone of Andeira was an iron ore, the earth mentioned here must have been a zinc ore of some kind. The most likely possibility, because of its common occurrence in the general area, is calamine. The main objection to its identification as calamine is that this ore usually occurs in the form of a rather hard compact mineral which Greek writers would call a stone rather than an earth, but perhaps it was calamine that had been refined by roasting to drive out the combined water, and then pulverized. Such preliminary treatment would have been almost necessary for the successful smelting of this ore. On grammatical grounds, the objection to the identification of the earth as calamine in any form is that it is the stone of Andeira, not the earth, which is said to yield the false silver, but this statement could well be based on a lack of understanding of the chemistry of the process by the ancient metallurgists or by the writer of the account. Some significance may be attached to the fact that this earth is alluded to in such a vague way, without a specific name and without a mention of its source. Possibly, in their desire to preserve secrecy, the metallurgists deliberately withheld this information, as well as other essential facts, from the writer of the account. This same tendency to secrecy in regard to what may have been the same mineral substance appears to occur in at least one later Greek account in which the author fails to identify by either name or place of origin a particular earth used in making a copper alloy which may have been brass.

Whatever may have been the exact identities of the ores and other raw materials used in the process, and whatever may have been the various essential but unmentioned working details, there seems to be no doubt that the false silver produced in the second step was more or less pure zinc. It must have been a white metal that resembled silver but was not silver, and in all probability it also was not tin or

<sup>47</sup> Leaf, W., *Strabo on the Troad* (Cambridge, 1923), p. 289.

<sup>48</sup> Diergart, P., *Journal für praktische Chemie*, CLXXV (1903), pp. 330-331.



lead since either would have been given its usual name. This leaves zinc as the only possibility among the metals known in Greek times. Diergart<sup>49</sup> was of the opinion that pure zinc could not have been produced in this process in view of the likelihood that the reduction to zinc could not have occurred without the simultaneous formation of iron. He concluded that the product was an alloy of the two metals containing a few per cent of iron. However, such impure zinc would have served almost as well as pure zinc for alloying with copper in the last step of the process. There is also the possibility that the zinc was separated by distillation. The Greek verb ἀποστᾶλει in the text appears to imply the production of the zinc in drops, or drop by drop, which at least hints at a distillation process. Leaf<sup>50</sup> interprets the passage in this sense by translating as follows: Near Andeira there is a stone which when calcined becomes iron; and then, when treated in the furnace with a certain earth, distills mock silver. Helm<sup>51</sup> suggested that the reduction was carried out in a vessel with a tight fitting cover, and that the vessel was also provided with an outlet tube in the bottom into which the zinc vapor passed and condensed, finally to emerge as drops of molten metal from the bottom of this condenser tube. Though this kind of apparatus has been used for the production of zinc in modern times, no archaeological or literary evidence exists for the use of any such apparatus in ancient times. However, it might have been possible to condense the zinc in drops on the walls and flues of a furnace of special design if a large excess of charcoal was used for the reduction, though the efficiency of the operation would probably have been low because of the loss of much of the zinc through oxidation. If the metal had been obtained by distillation it would, of course, have been purer than any metal obtained without such separation.

"This, added to copper, forms the so-called mixture, which some call oreichalkos." The metal to which the zinc was added may have been bronze rather than copper, for χαλκός here translated as copper is a generic term that included at the time of this account any metal that

<sup>49</sup> Diergart, P., *Journal für praktische Chemie*, CLXXIV (1902), pp. 339-345.

<sup>50</sup> Leaf, W., *Strabo on the Troad* (Cambridge, 1923), p. 284.

<sup>51</sup> Helm, O., *Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (1895), p. 623.

had the general appearance of copper. Hence it included ordinary bronze as well as copper itself. Indeed, since bronze was more commonly used for most purposes, the word more often denotes this alloy than unalloyed copper. Only when a modifying adjective is used is there any certainty as to which is meant. Hence the alloy formed by fusion with zinc could have been either brass or zinc bronze, and consequently *oreichalkos* could mean either one.

Though κράμα means mixture in general, it usually means mixed wine, and less often a medicinal mixture. Its use here to denote a mixture of metals is quite exceptional, and this appears to be indicated also by the use of καλούμενον (so-called). Perhaps κράμα is here a technical term that would be better translated as mixed metal. Its translation as amalgam by Leaf<sup>52</sup> is not satisfactory since this term is now generally reserved for an alloy that contains mercury as one of its components.

From the standpoint of the history of zinc and its alloys with copper this account by Theopompus is important not only because it contains the earliest mention of a process for the isolation of this metal but because it also contains the earliest mention of the manufacture of an alloy containing zinc and copper. No other ancient author except Strabo, who merely repeats the account of Theopompus, describes any process that can be interpreted as involving the direct alloying of zinc with copper or bronze. This method of making brass or zinc bronze apparently never was used either continuously or on a large scale in ancient times. According to all the evidence, none but the cementation process was employed when orichalcum came to be manufactured regularly on a large scale in Roman Imperial times.

Certain accounts in the works of Greek writers of the Hellenistic period have often been cited as containing allusions to the manufacture of brass, but unfortunately these accounts are even more ambiguous and sketchy than the one by Theopompus. The earliest of these Hellenistic accounts is contained in the treatise *On Stones* by Theophrastus of Eresos written near the end of the fourth century B.C. This account reads as follows: ἰδιωτάτη δὲ ἡ τῷ χαλκῷ μίγνυμένη· πρὸς γὰρ τῷ τήκεσθαι καὶ μίγνυσθαι καὶ δύναμιν ἔχει περιττήν ὥστε τῷ κάλλει τῆς χροᾶς ποιεῖν διαφοράν. (The most unusual

<sup>52</sup> Leaf, W., *Strabo on the Troad* (Cambridge, 1923), p. 284.

earth is the one mixed with copper; for in addition to melting and mixing, it also had the remarkable power of improving the beauty of the color.)<sup>53</sup> Among those who assume without question that this account refers to the manufacture of brass by the calamine cementation process are Rossignol,<sup>54</sup> Rickard,<sup>55</sup> and Forbes.<sup>56</sup> The validity of this uncritical conclusion will now be examined briefly.

In the first place it is uncertain that ordinary copper is the metal that was treated with the earth. In another section of this same treatise, where Theophrastus describes the preparation of verdigris by the action of sour grape residues on copper, he uses the term χαλκὸς ἐρυθρὸς (red copper) for the metal that was employed, which clearly indicates that unalloyed copper is meant. The lack of this qualifying adjective in the above account makes it appear likely that the metal treated with the earth was bronze rather than copper. In the second place there is no evidence of any kind that the earth was calamine, or any other kind of zinc ore. It could have been any one of a number of earthy minerals. The existence in ancient times of the practice of melting metals with various mineral substances of this kind is shown by the many recipes in the Leyden Papyrus X that describe this practice explicitly.<sup>57</sup> Some of these substances were arsenic minerals, such as realgar, which served to whiten the copper through the formation of a copper-arsenic alloy, others were clayey minerals which served to exclude air from the surface of the metal on fusion and thus prevent oxidation, and still others were bituminous materials which served to reduce metal oxides on fusion and produce clean metal. There are two indications that the unusual earth in this account was a bitumen of some sort. One is the melting of the earth and the other is the mention by Theophrastus in the very next sentence following this account of another peculiar earth that was undoubtedly a natural bituminous substance.<sup>58</sup> Though it is possible

<sup>53</sup> Text and translation according to Caley, E. R., and Richards, J. F. C., *Theophrastus On Stones* (Columbus, 1956), pp. 26, 55.

<sup>54</sup> Rossignol, J. P., *Les métaux dans l'antiquité* (Paris, 1863), p. 254 (footnote).

<sup>55</sup> Rickard, T. A., *Man and Metals* (New York, 1932), p. 157.

<sup>56</sup> Forbes, R. J., *Metallurgy in Antiquity* (Leiden, 1950), p. 278.

<sup>57</sup> Berthelot, M., *Archéologie et histoire des sciences* (Paris, 1906), pp. 268–283, 290–291, 296–299.

<sup>58</sup> Caley, E. R., and Richards, J. F. C., *Theophrastus On Stones* (Columbus, 1956), pp. 167–169.

that Theophrastus in this account is alluding to the manufacture of brass or zinc bronze, it seems much more probable that he is alluding to a mere refining process in which bronze, in the form of crude or scrap metal, was melted with a natural bituminous material in order to obtain clean metal of improved appearance.

Also frequently cited as evidence for the manufacture of brass in Greek times are two accounts in the pseudo-Aristotelian work *On Marvelous Things Heard*, a compilation usually attributed to students or successors of Aristotle, and believed to have been written for the most part in the third century B.C., though some passages of this work are evidently based on earlier sources. The following account, which comprises all of sec. 49, is apparently based, at least in part, on such sources: Φασὶ δὲ καὶ ἐν Ἰνδοῖς τὸν χαλκὸν οὕτως εἶναι λαμπρὸν καὶ καθαρὸν καὶ ἀνίωτον, ὥστε μὴ διαγινώσκεσθαι τῇ χροᾷ πρὸς τὸν χρυσόν, ἀλλ' ἐν τοῖς Δαρείου ποτηρίοις βατιακᾶς εἶναί τινας καὶ πλείους, ὥς εἰ μὴ τῇ ὀσμῇ, ἄλλως οὐκ ἦν διαγινῶναι πρότερόν εἰσι χαλκαῖ ἢ χρυσαῖ. (They also say that among the Indians the bronze is so bright, clean and free from corrosion that it is indistinguishable in appearance from gold, but that among the cups of Darius there is a considerable number which could not be distinguished as bronze or gold except by the odor.)

On the basis of this account Partington<sup>59</sup> remarks that, "Brass was probably made in Persia in the Achaemenian Period, since Darius is said to have had a bowl like gold in appearance but distinguishable by its unpleasant smell." Forbes<sup>60</sup> appears to follow Partington in part when he asserts that, "In Iran brass came into use in the Achaemenian Period. Darius is said to have possessed an 'Indian' cup which looked like gold but had a disagreeable smell, which points to brass." Certain inaccuracies are apparent in these partial paraphrases, but the main point is that neither the tentative remark of Partington nor the positive assertion of Forbes can be justified on the basis of this account. There is even the possibility that this account may be an exaggerated or fanciful traveler's tale, but even when taken literally it provides no real evidence for the use of brass in either India or Persia at the time of Darius.

<sup>59</sup> Partington, J. R., *Origins and Development of Applied Chemistry* (London, 1935), p. 410.

<sup>60</sup> Forbes, R. J., *Metallurgy in Antiquity* (Leiden, 1950), p. 279.

In the text the word χαλκός is used to denote the metal that is like gold in appearance. Usually this has been translated as copper, but, since it is obviously yellow in color, bronze is a much better translation. There is no justification for translating as brass merely on the basis of color since polished bronze of proper tin content may also resemble gold or certain gold alloys rather closely in color. Moreover, in another part of this same work (sec. 58) a distinction is made by the use of different words between the metal of a certain bronze statue and the metal of others made of *oreichalkos*. After some remarks on the copper deposits of the island of Demonesus, the writer goes on to say: ἔστι δὲ αὐτόθι χαλκός κολυμβητῆς ἐν δυοῖν ὀργυιαῖς τῆς θαλάσσης· ὅθεν ὁ ἐν Σικυωνί ἐστιν ἀνδριάς ἐν τῷ ἀρχαίῳ νεῷ τοῦ Ἀπόλλωνος καὶ ἐν Φενεῷ οἱ ὀρείχαλκοι καλούμενοι. (There is also copper to be dived for in two fathoms of sea. From this is made the statue in Sicyon in the ancient temple of Apollo, and those in Pheneus called oreichalkos statues.) From the wording it might seem that these statues were composed of the copper itself, but in view of the fact that Greek statues generally were made of alloyed copper, the correct meaning must be that the copper was used in making the alloys for these statues. It may also be noted that no archaeological evidence exists for the use of brass or zinc bronze in India or Persia at the time of Darius.

The second account in the work *On Marvelous Things Heard*, which merits more serious and extensive consideration, comprises all of sec. 62, and reads as follows: Φασὶ τὸν Μοσσύνοικον χαλκὸν λαμπρότατον καὶ λευκότερον εἶναι, οὐ παραμιγνύμενον αὐτῷ κασσιτέρου, ἀλλὰ γῆς τινὸς αὐτοῦ γινομένης καὶ συνεψομένης αὐτῷ. λέγουσι δὲ τὸν εὐρόντα τὴν κρᾶσιν μηδένα διδάξαι· διὸ τὰ προγεγονότα ἐν τοῖς τόποις χαλκῶματα διάφορα, τὰ δ' ἐπιγιγνόμενα οὐκέτι. (They say that the bronze of the Mossynoeci is very shiny and light in color, though tin is not mixed with the copper, but a kind of earth which occurs there is smelted with it. But they say that the discoverer of the mixing process did not instruct anyone else, so that the bronze objects formerly produced there are superior, whereas those made subsequently are not.) The first phrase is usually translated thus: (They say that the copper of the Mossynoeci is very shiny and light in color, though tin is not mixed with it.) Although this may have been the meaning the writer of the account intended to convey, a pale or light-colored metal

could not have been copper itself, but must have been an alloy of copper. The word χαλκός may mean either copper or bronze, and bronze seems the better translation. However, from the standpoint of grammar the reflexive pronoun at the end of the phrase then appears to refer back to bronze, and this poses a difficulty from the standpoint of metallurgy, for obviously tin would not be added to bronze but to copper. As indicated by the translation this difficulty may be resolved by assuming that the reflexive pronoun refers back to χαλκός in its alternate meaning of copper.

The word λευκότερον used in describing the appearance of the alloy may be translated as very white instead of very pale or very light in color. If this word is so understood, then the alloy could not have been ordinary bronze or brass. Tin bronzes containing more than 25 per cent of tin are white and so are brasses containing more than 75 per cent of zinc, though such alloys are too brittle for most practical uses. But there is another possibility. It could have been a copper-arsenic alloy, for such an alloy, even when it contains a relatively small proportion of arsenic, is also white. Alloys of copper with arsenic, which may be called arsenic bronzes, were known in the Aegean region from very early times, as has been shown by chemical analyses of certain prehistoric metal objects.<sup>81</sup> Moreover, the existence in ancient times of the practice of whitening copper by treating it with arsenic minerals, or with products derived from such minerals, is shown by two recipes in the Leyden Papyrus X. One of these (No. 23) reads as follows:

Χαλκοῦ λεύκοσις

Χαλκὸν λευκὸν ποιῆσαι, ὥστε μειγέσθαι ἀσήμῳ, ἴσον ἴσῳ, καὶ ἀνένκλητον εἶναι· λαβὼν χαλκὸν Κύπριον, χεύνευσον, βαλὼν εἰς τὴν μνᾶν σανδαράχης, τῆς σαπρᾶς, τῆς σιδηριζούσης Ἰβ', καὶ στυπτηρίας σχιστῆς Λε', καὶ χώνεε. Τῇ δευτέρᾳ χωνεύσει βάλλεται κηροῦ Ποντικῷ Λδ', εἰ μὴ, καὶ πυροῦται καὶ ῥήσσεται.<sup>82</sup>

(Whitening of Copper)

To whiten copper, so that it can be mixed with silver bullion in equal parts, and not be recognized: take Cyprian copper, melt it,

<sup>81</sup> Caley, E. R., *Hesperia, Supplement VIII* (1949), pp. 60–63.

<sup>82</sup> Text of Berthelot, M., *Archéologie et histoire des sciences* (Paris, 1906), p. 278.

having added for each mina 2 drachmas of decomposed irony realgar and 5 drachmas of lamellose alum, and cast it. For the second fusion 4 drachmas of Pontic wax are added; if not, it is burnt by the fire and breaks.)

Probably the decomposed realgar mentioned in this recipe was obtained by roasting the natural mineral, possibly under reducing conditions which would produce a mixture of arsenious oxide and arsenic having a grey color. The alum perhaps served as a flux. Both the roasted arsenic mineral and the alum would have anciently been classified as earths. The wax probably prevented oxidation of the copper-arsenic alloy. One objection to this recipe as a parallel to the account in the work *On Marvelous Things Heard* is the discrepancy in time. The Leyden Papyrus X was probably compiled in the third century A.D., whereas the account was probably written in the third century B.C., and the wording would appear to indicate that the process itself was even earlier. However, many of the recipes in the papyrus undoubtedly represent technical processes that had been in use for a very long period. Whether any credence can be placed in the statement in the second sentence of the account as to the loss of the knowledge of the process is perhaps doubtful since the mention of lost arts is a favorite device for adding interest to stories.

In view of the possibility that the bronze of the Mossynoeci may have been a copper-arsenic alloy, it cannot be unquestionably assumed, as so many have done, that the earth mentioned in this account is calamine and that the alloy produced without tin is brass. Nevertheless, there is a considerable probability that the account does allude to the manufacture of brass by the cementation process, and that it is the earliest known allusion to this process. What seems to support this view is that the only known Greek objects composed of brass or zinc bronze (Table III) have been found at or near the sites of colonies or settlements on the Black Sea, near the shore of which, in Pontus, dwelt the people known as the Mossynoeci. Even if this account in the work *On Marvelous Things Heard* does not allude to a process for making brass, it is still important, as is likewise the one in the treatise *On Stones* of Theophrastus, for explaining how the manufacture of brass by the cementation process came to be discovered. Once the practice of heating various mineral substances with

copper came into use, it was inevitable that sooner or later zinc ores would be heated with the metal in the presence of a reducing agent and brass would be produced. What remains unknown, and probably always will remain unknown, is exactly where and when this discovery took place. Largely on the basis of the account just discussed, Forbes<sup>63</sup> believes that the discovery took place in Pontus, but the evidence seems too incomplete to establish this with certainty. Forbes is also of the opinion that the discovery took place in the first half of the first millenium B.C., but real evidence for such an early date appears to be lacking. The available literary evidence does not indicate a date any earlier than the fourth century B.C., and the archaeological evidence does not indicate a date any earlier than the second century B.C. at the earliest. It was not until after the middle of the first century B.C. that the intentional manufacture of brass by the cementation process began on any considerable scale, and its manufacture by this process on a continuous and large scale did not begin until after the foundation of the Roman Empire.

The essential difference in composition between the alloys produced before the middle of the first century B.C. and those produced later has already been pointed out. Another distinct difference is in their use. The earlier alloys were never used for coinage, whereas the orichalcum of the Romans was used chiefly for coinage, and indeed at the beginning and for a considerable time afterwards this appears to have been its only use. Our knowledge of the composition of orichalcum must therefore be derived chiefly from analyses of Roman Imperial coins composed of this alloy.

<sup>63</sup> Forbes, R. J., *Metallurgy in Antiquity* (Leiden, 1950), pp. 279–280.



#### IV. PREVIOUS ANALYSES OF ORICHALCUM COINS OF THE ROMAN EMPIRE

The first analyses of orichalcum coins, which, indeed, were the first quantitative analyses of brass objects of any kind, were made by the celebrated pioneer analytical chemist Martin Heinrich Klaproth. Though he announced the results of his investigation in a paper entitled "Mémoire de numismatique docimastique" read before the Royal Academy of Sciences and Belles-Lettres of Berlin on July 9, 1795, the first publication<sup>64</sup> of these results was delayed until 1798. The results of his analyses as he reported them are shown in Table VI. These same results calculated on a percentage basis are shown in Table VII. As might be expected from the state of numismatic knowledge in his day, his descriptions of the coins he analyzed are imperfect, though they are adequate for approximate identification as indicated in Table VI. His method of analysis, which he had to devise for the purpose, was inadequate by present standards and could not yield

TABLE VI

ANALYSES OF SESTERTII AND DUPONDII BY KLAPROTH

Coin No.	Copper Grains	Zinc Grains	Tin Grains	Lead Grains	Iron Grains	Total Grains
1	119	31	—	—	—	150
2	187	46	—	—	—	233
3	296	84	—	—	—	380
4	293	59	3	4	1	360
5	326	53	3	—	—	382
6	294	60	11	—	—	365

<sup>64</sup> Klaproth, M. H., *Mémoires de l'académie royale des sciences et belles-lettres, Berlin, Classe de philosophie expérimentale* (1798), pp. 97-113. A German version of this same paper was later published in *Sammlung der deutschen Abhandlungen, welche in der königlichen Akademie der Wissenschaften zu Berlin vorgelesen wurden in den Jahren 1792-1797, Experimental-Philosophie* (1799), pp. 3-14, under the title "Beitrag zur numismatischen Docimasie," and still later under the same title there appeared a modified German version in *Allgemeines Journal der Chemie*, VI (1801), pp. 227-244.

accurate results. However, it seems likely from later analyses of similar coins that the percentage figures for the main components, copper and zinc, shown in Table VII, are not in error by any more than about one per cent. Already apparent from this first series of results are chronological differences in the composition of orichalcum.

*Descriptions as Given by Klaproth*

1. *Obv.*: Castor and Pollux as two horsemen, with the inscription  
CAESAR AUGUSTUS GERMANICUS.  
*Rev.*: S C in center with illegible inscription.  
Wt. = 150 grains [9.7 grams].
2. Coin of Nero and Drusus, sons of Germanicus.  
*Obv.*: Quadriga.  
*Rev.*: An indistinct figure which originally represented either an upright soldier or a trophy.  
Wt. = 233 grains [15.1 grams].
3. *Obv.*: Head of Tiberius Claudius.  
Oblong counterstamp behind head.  
*Rev.*: Civic crown with inscription  
EX S C OB CIVES SERVATOS.  
Wt. = 380 grains [24.6 grams].
4. *Obv.*: Head of Vespasian.  
*Rev.*: Soldier seated.  
Wt. = 360 grains [23.3 grams].
5. *Obv.*: Head of Trajan.  
*Rev.*: Seated figure, possibly Vesta.  
Wt. = 382 grains [24.8 grams].
6. *Obv.*: Head of Trajan.  
*Rev.*: Same as No. 5.  
Wt. = 365 grains [23.7 grams].

*Identifications*

1. Dupondius of Caligula, A.D. 37– 41
2. Dupondius of Caligula, A.D. 37– 41
3. Sestertius of Claudius, A.D. 41– 43
4. Sestertius of Vespasian, A.D. 71– 73
5. Sestertius of Trajan, A.D. 98–117
6. Sestertius of Trajan, A.D. 98–117

After the publication of the analyses of Klaproth, no results of any investigation of the composition of orichalcum coins were published

for half a century except the results of an analysis of a single coin by Göbel.<sup>65</sup> He described this coin as follows:

*Obv.*: Tiberius Claudius Caesar.

*Rev.*: Bust of Antonia Augusta.

TABLE VII

ANALYSES OF KLAPROTH CALCULATED AS PERCENTAGES

<i>Coin No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Iron %</i>	<i>Total %</i>
1	79.3	20.7	—	—	—	100.0
2	80.3	19.7	—	—	—	100.0
3	77.9	22.1	—	—	—	100.0
4	81.4	16.4	0.8	1.1	0.3	100.0
5	85.3	13.9	0.8	—	—	100.0
6	80.6	16.4	3.0	—	—	100.0

This was evidently a dupondius of Claudius struck in A.D. 41. Göbel reported that the metal of this coin was composed of 72.20% copper and 27.7% zinc. These results must be regarded as only approximate, for he found no other metals and his method of analysis was not very good. Another coin, which Göbel evidently took to be Roman, was also analyzed and found to contain 10.5% zinc. However, his description indicates that this coin was a modern forgery. Göbel also analyzed a number of brass antiquities found in the Russian Baltic provinces, a few of which were probably of Roman origin. The composition of these is discussed later.

A small series of orichalcum coins was analyzed by Phillips.<sup>66</sup> His results, recalculated on the basis of present atomic weights from his analytical data, are shown in Table VIII. Though these results are probably more accurate than those obtained by Klaproth or Göbel, they are by no means free from error as is indicated by the unsatisfactory summations of two of the analyses. His imperfect descriptions and the corresponding identifications are also shown in the table. In addition to these four coins, Phillips analyzed a sestertius of Faustina

<sup>65</sup> Göbel, F., *Über den Einfluß der Chemie auf die Ermittlung der Völker der Vorzeit oder Resultate der chemischen Untersuchung metallischer Alterthümer* (Erlangen, 1842), p. 29.

<sup>66</sup> Phillips, J. A., *Journal of the Chemical Society*, IV (1852), pp. 252-300.

Junior, which he found to contain a higher proportion of lead than zinc and almost as much tin as zinc. The metal of this coin should properly be classed as a zinc bronze.

TABLE VIII

ANALYSES OF SESTERTII AND A DUPONDIUS BY PHILLIPS

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Total %
1	82.38	17.36	—	—	0.36	100.10
2	81.07	17.82	1.05	—	—	99.94
3	83.13	15.90	—	—	0.51	99.54
4	85.77	10.89	1.15	1.74	0.75	100.30

*Descriptions as Given by Phillips*

1. Large Brass of the Cassia Family. About 20 B.C.  
Wt. = 365 grains [23.7 grams].
2. Large Brass of Nero. A.D. 60. *Rev.*: Rome seated.  
Wt. = 435 grains [28.2 grams].
3. Titus. A.D. 79.  
Wt. = 178 grains [11.5 grams].
4. Hadrian. A.D. 120. *Fortunae reduci*.  
Wt. = 365 grains [23.7 grams].

*Identifications*

1. Sestertius of Augustus struck under C. Cassius Celler as moneyer.
2. Sestertius of Nero probably struck in the period A.D. 64–66.
3. Dupondius of Titus. The stated date is probably correct.
4. Sestertius of Hadrian which could have been struck at various times in the period A.D. 117–138.

Among a considerable number of ancient objects and materials analyzed by Girardin<sup>67</sup> was a single Roman orichalcum coin which he described as having on one side a bust of Antonia Augusta and on the other the inscription Titus Claudius Caesar Augustus Imperator. The improbable reading "Titus" was apparently based on the first two letters which in all probability should be interpreted as "Tiberius". On the basis of this interpretation the coin was probably a dupondius of Claudius struck in A.D. 41. Giradin found that the coin contained 81.4% copper and 18.6% zinc. No other metals were reported and no great accuracy can be ascribed to his results.

<sup>67</sup> Girardin, J., *Journal für praktische Chemie*, LX (1853), p. 92.

Genth<sup>68</sup> analyzed a coin of Trajan and one of Hadrian. Since he gave neither weights nor descriptions, the denominations and exact dates of these coins are unknown. His results are shown in Table IX. No. 1 was the coin of Trajan and No. 2 the coin of Hadrian. Though his analyses are more complete than those of his predecessors, their accuracy is not high as is shown by the high summations.

TABLE IX

ANALYSES OF COINS OF TRAJAN AND HADRIAN BY GENTH

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Silver %	Total %
1	88.58	7.56	1.80	2.28	0.29	0.21	100.72
2	86.92	10.97	0.72	1.10	0.18	0.30	100.19

The results obtained by Genth have had a curious history of careless citation by later writers. Bibra<sup>69</sup> in one place wrongly ascribed the first set of results to Phillips, and in another place he ascribed both sets to himself. Moreover, Bibra interchanged the names of the emperors. Stohman and Kerl<sup>70</sup> ascribed both sets of results to Pöpplein. Apparently these writers did not consult the original publication.

The most extensive early series of chemical analyses of orichalcum coins was carried out by Bibra.<sup>71</sup> His results are listed in Table X. Unfortunately, the coins he analyzed cannot be closely dated since he gave only the names of the emperors and the weights of the coins. The denominations of the coins shown in the table have been decided from these weights. The perfect summations of his analyses arise from the fact that he determined copper by difference, i.e., he subtracted the percentages of all the other components from 100.00% in order to obtain the percentage of copper. This means that the accumulated errors of all the other determinations fell on the copper which resulted in a corresponding error in the determination of this element. His determinations of some of the other elements may also be somewhat in error. For example, it is certain from his method of analysis and

<sup>68</sup> Genth, F. A., *Journal of the Franklin Institute*, XXXVI (1858), p. 266.

<sup>69</sup> Bibra, E. von, *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 60–61, 64–65.

<sup>70</sup> Stohman, F. and Kerl, K., *Encyklopädisches Handbuch der Technischen Chemie* (Braunschweig, 1888–1905), IV, pp. 2013–2014.

<sup>71</sup> Op.cit., pp. 52–55.

from the results of later analyses that his stated percentages of nickel are generally too high. In spite of these uncertainties, the analyses of Bibra provide much valuable information.

TABLE X

ANALYSES OF ORICHALCUM SESTERTII AND DUPONDII BY BIBRA

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Nickel %	Anti-mony %	Total %
1	92.57	5.15	1.05	trace	1.03	0.20	trace	100.00
2	87.05	11.80	0.72	trace	0.43	trace	trace	100.00
3	77.44	21.50	0.30	trace	0.32	0.24	0.20	100.00
4	88.19	10.23	0.51	0.30	0.55	0.22	none	100.00
5	86.30	12.94	0.52	trace	0.14	0.10	none	100.00
6	82.13	15.35	1.12	trace	1.00	0.40	trace	100.00
7	83.95	12.42	2.22	0.30	0.39	0.50	0.22	100.00
8	78.24	20.23	0.70	0.13	0.40	0.30	none	100.00
9	90.76	5.12	3.22	0.70	0.13	trace	0.27	100.00
10	91.24	7.14	0.32	0.44	0.52	0.34	none	100.00
11	88.50	9.05	1.27	0.30	0.35	0.43	0.10	100.00
12	82.91	15.57	0.60	0.06	0.70	0.08	0.08	100.00
13	82.35	16.84	0.43	trace	0.38	trace	trace	100.00
14	89.92	6.74	1.52	0.37	1.15	0.30	none	100.00
15	90.49	7.04	1.10	0.20	1.07	0.10	trace	100.00
16	91.72	5.33	1.55	trace	1.30	trace	trace	100.00
17	87.88	11.28	none	0.09	0.37	0.38	none	100.00
18	87.86	8.14	3.86	trace	0.12	trace	trace	100.00
19	81.47	10.30	6.62	0.02	0.01	0.28	1.30	100.00
20	85.63	6.07	4.62	2.00	1.07	0.40	trace	100.00
21	90.28	5.90	2.00	0.41	0.91	0.28	0.22	100.00
22	87.70	7.92	2.90	0.42	0.73	0.31	0.02	100.00
23	85.60	5.77	4.02	4.17	0.13	0.21	trace	100.00

*Identifications and Notes*

1. Sestertius of Augustus. Wt. = 23.7 grams.  
Also contains a trace of cobalt and a trace of sulfur.
2. Sestertius of Augustus. Wt. = 23.4 grams.  
Also contains a trace of arsenic.
3. Sestertius of Claudius. Wt. = 24.9 grams.  
Also contains a trace of sulfur.
4. Dupondius of Domitian. Wt. = 10.2 grams.  
Also contains a trace of cobalt and a trace of sulfur.
5. Dupondius of Nerva. Wt. = 11.6 grams.

6. Sestertius of Trajan. Wt. = 17.3 grams.  
Also contains a trace of sulfur.
7. Dupondius of Trajan. Wt. = 9.0 grams.
8. Dupondius of unidentified emperor, but said to have been struck in the first half of the first century A.D. Wt. = 10.3 grams. Also contains a trace of sulfur.
9. Sestertius of unidentified emperor, but said to have been struck in the first half of the first century A.D. Wt. = 15.9 grams. Also contains a trace of silver.
10. Sestertius of Hadrian. Wt. = 21.2 grams.
11. Dupondius of Hadrian. Wt. = 13.7 grams.  
Also contains a trace of sulfur.
12. Dupondius of Hadrian. Wt. = 10.4 grams.
13. Sestertius of Hadrian. Wt. = 19.5 grams.  
Also contains a trace of cobalt and a trace of arsenic.
14. Sestertius of Sabina. Wt. = 25.8 grams.
15. Sestertius of Sabina. Wt. = 20.0 grams.  
Also contains a trace of sulfur.
16. Sestertius of Antoninus Pius. Wt. = 24.0 grams.  
Also contains 0.10% of sulfur.
17. Sestertius of Antoninus Pius. Wt. = 17.9 grams.
18. Sestertius of Antoninus Pius. Wt. = 17.0 grams.
19. Sestertius of Marcus Aurelius. Wt. = 18.1 grams.  
Also contains traces of cobalt, silver and sulfur.
20. Sestertius of Marcus Aurelius. Wt. = 17.9 grams.  
Also contains a trace of sulfur.
21. Dupondius or possibly an As of Lucius Verus.  
Wt. = 10.7 grams. Also contains a trace of sulfur.
22. Sestertius of Commodus. Wt. = 17.6 grams.  
Also contains a trace of arsenic.
23. Sestertius of Commodus. Wt. 22.3 grams.  
Also contains 0.10% sulfur.

A sestertius of Julia Soaemias, one of three late sestertii analyzed by Hofmann,<sup>72</sup> was found to be composed of an alloy that may be classed as orichalcum, for the zinc content was 17.08%, the tin content only 4.00%, and the lead content only 0.95%. The composition of this coin is considered in more detail under the discussion of the composition of late sestertii and dupondii.

Helm<sup>73</sup> analyzed a small series of orichalcum coins. The results of his analyses are shown in Table XI. He gave a date range for the coins

<sup>72</sup> Hofmann, K. B., *Numismatische Zeitschrift*, XVI (1884), p. 10.

<sup>73</sup> Helm, O., *Zeitschrift für Ethnologie*, XXVII (1895), pp. 19-20.

of Vespasian and Marcus Aurelius that coincides with the period for the reign of these emperors and the range A.D. 98–112 for the two coins of Trajan. Since he gave no descriptions, the coins cannot be more closely dated. Nor does he state their denominations. These have been decided from the weights. The perfect summations of his analyses indicate that he determined one of the components by difference, probably the copper.

TABLE XI

ANALYSES OF SESTERTII AND A DUPONDIUS BY HELM

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Nickel %	Silver %	Total %
1	85.89	13.02	0.40	0.31	0.17	none	0.21	100.00
2	80.09	15.45	2.28	1.63	0.15	0.40	trace	100.00
3	87.12	9.90	2.13	0.48	0.20	none	0.17	100.00
4	87.31	7.08	4.02	0.83	0.42	0.34	none	100.00

*Identifications*

1. Dupondius of Vespasian. Wt. = 11 grams.
2. Sestertius of Trajan. Wt. = 21.2 grams.
3. Sestertius of Trajan. Wt. = 18.2 grams.
4. Sestertius of Marcus Aurelius. Wt. 18.2 grams.

Grueber<sup>74</sup> published three analyses by Gowland of coins of Augustus, the results of which are shown in Table XII. The descriptions given by Grueber are also shown, except for the dates he assigned to the coins. For No. 1 he assigned the range 27–19 B.C., and for the other two he assigned the date 9 B.C. Later authorities assign different dates. Grant<sup>75</sup> is of the opinion that coins of the type of No. 1 were struck in 17 B.C. and later, and Mattingly<sup>76</sup> assigns the date 22 B.C. to coins of the types of Nos. 2 and 3. Since only the main components of the alloys were determined, and then only through the first decimal place, these analyses should be regarded as only approximate.

<sup>74</sup> Grueber, H. A., *Numismatic Chronicle*, Ser. 4, IV (1904), p. 244.

<sup>75</sup> Grant, M., *From Imperium to Auctoritas* (Cambridge, 1946), p. 457.

<sup>76</sup> Mattingly, H., *B.M.C. Coins of the Roman Empire* (London, 1923), I, p. 32.



TABLE XII

ANALYSES OF COINS OF AUGUSTUS BY GOWLAND

<i>Coin</i> <i>No.</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Lead</i> %	<i>Total</i> %
1	78.7	20.6	0.7	100.0
2	76.7	23.3	none	100.0
3	76.4	23.6	none	100.0

*Descriptions*

1. Dupondius of Augustus struck in the East.  
*Obv.*: AVGVSTVS. Head of Augustus to r.  
*Rev.*: C · A within laurel wreath ornamented with prows.
2. Sestertius of Augustus struck in Rome.  
*Obv.*: OB CIVIS SERVATOS. Oak wreath between two laurel branches.  
*Rev.*: C · ASINIVS C · F · GALLVS IIIVIR · A · A · A · F · F.  
In center, S · C.  
Wt. = 387.2 grains [25.1 grams].
3. Dupondius of Augustus struck in Rome.  
*Obv.*: AVGVSTVS TRIBUNIC · POTES.  
within wreath.  
*Rev.*: C · ASINVS GALLVS IIIVIR · A · A · A · F · F.  
In center, S · C.  
Wt. = 203.3 grains [13.2 grams].

One of a group of sixteen Celtic coins analyzed by C. Virchow and co-workers was evidently composed of orichalcum, though it is described as a bronze coin by Forrer<sup>77</sup> in his publication and discussion of the analytical results. This coin, listed as No. 10 in the published table of analyses, bore a head in imitation of that of Augustus, the representation of a bull, and the single word INDVTILLI. Forrer ascribed this so-called bronze coin to *Germanus-Indutilli fili* and remarked that it was similar to the one shown in Figure 175 of his comprehensive treatise on Celtic coinage.<sup>78</sup> Coins of this type were struck at Treviri and are believed to belong to the latest period of issue of the Celtic coinage of Gaul. The results of the analysis are shown in Table XIII.

<sup>77</sup> Forrer, R., *Zeitschrift für Ethnologie*, XLI (1909), pp. 458-462.

<sup>78</sup> Forrer, R., *Keltische Numismatik der Rhein- und Donaulande* (Straßburg, 1908).

TABLE XIII

ANALYSIS OF A CELTIC ORICHALCUM  
COIN BY VIRCHOW

<i>Metal</i>	<i>%</i>
Copper .....	81.68
Zinc .....	16.46
Tin.....	0.10
Lead .....	1.25
Iron .....	0.22
Nickel .....	0.24
Silver .....	0.05
Total .....	100.00

This is the only known example of an orichalcum coin not of official Roman issue. Perhaps other coins of the same type had a similar composition, and possibly late Celtic coins of other types were sometimes struck in orichalcum. It seems very probable that earlier or contemporaneous Roman orichalcum coins were the source of the metal for such coins.

The analyses of orichalcum coins published by Mattingly<sup>79</sup> exceed in number those published by any one writer up to the present time.<sup>80</sup> These analyses were executed mostly in the laboratory of the British Museum and at the Royal Mint. Though Mattingly names the analysts, or at least the persons responsible for the execution of the analyses, he does not state which analyses were done by particular individuals. These analyses may be divided into two distinct groups, one in which the zinc content of the coins was actually determined and the other in which the zinc content was merely estimated. The results of the first group are shown in Table XIV and those of the second group in Table XV. As shown by the figures for the individual determinations and for the summations, the quality of the analyses of the first group varies greatly. Most of the determinations are expressed only through the first decimal place, which is indicative of the ap-

<sup>79</sup> Mattingly, H., *B.M.C. Coins of the Roman Empire* (London, 1923-), I, p. lvii; III, pp. xxi-xxii; IV, pp. xvi-xvii.

<sup>80</sup> With the exception of the analyses listed by Hammer, J., *Der Feingehalt der griechischen und römischen Münzen* (Diss. Tübingen, 1906). However, those listed by Hammer are merely compiled from the publications of other writers, chiefly Bibra.

proximate nature of these determinations. Three of the summations are grossly deficient, which may indicate that oxidized coins were taken for analysis, that one or more of the individual determinations were inaccurate, or that components were present which were not determined. The six perfect summations are too many to be attributed to chance, and indicate the estimation of some component by difference. As far as the reported figures show, No. 8 is the only coin that was satisfactorily analyzed. The analyses of the second group are admittedly incomplete, though the proportions of copper, tin and lead in the coins appear to have been accurately determined. A closer estimate of the zinc content of the coins of this group seems possible by subtracting the sum of the percentages of copper, tin and lead of each analyses from 99.5%, a conservative estimate of the summation that would have been obtained if the analyses had been completed. The figures obtained in this way are shown in the fourth column of Table XV. Since no descriptions were given of the coins that were analyzed, no close estimate of their dates is possible. In spite of their various defects, many of the analyses published by Mattingly provide useful information.

TABLE XIV

ANALYSES OF ORICHALCUM COINS PUBLISHED BY MATTINGLY

<i>Coin No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Iron %</i>	<i>Total %</i>
1	76.85	21.33	—	0.20	1.62	100.00
2	81.1	15.7	—	—	3.2	100.0
3	79.5	16.6	trace	1.3	—	97.4
4	78.08	16.68	2.14	0.57	trace	97.47
5	82.2	16.5	0.5	0.8	—	100.0
6	83.4	16.4	—	trace	—	99.8
7	84.8	14.8	trace	trace	—	99.6
8	85.14	13.98	0.68	0.12	trace	99.82
9	86.5	13.5	—	—	—	100.0
10	86.1	13.4	0.2	—	—	99.7
11	85.7	13.6	—	—	—	99.3
12	83.7	12.7	2.8	0.8	—	100.0
13	86.41	13.59	—	trace	—	100.00
14	86.81	7.96	1.41	1.30	—	97.48

*Identifications*

1. Sestertius of Claudius, Mint of Rome
2. Dupondius of Antonia, Mint of Rome
3. Sestertius of Trajan
- 4- 6. Dupondi of Trajan
- 7-10. Sestertii of Hadrian
- 11-12. Dupondii of Hadrian
13. As of Antoninus Pius
14. As of Marcus Aurelius

TABLE XV

ESTIMATES OF COMPOSITION OF ORICHALCUM COINS  
PUBLISHED BY MATTINGLY

<i>Coin No.</i>	<i>Copper</i>	<i>Stated Zinc Content</i>	<i>Zinc Content by Difference</i>	<i>Tin</i>	<i>Lead</i>
	%	%	%	%	%
1	86.39	Over 12.0	13.1	—	trace
2	86.85	Over 12.0	12.6	—	trace
3	92.79	Over 7.0	6.7	trace	trace
4	88.71	Over 10.0	10.8	trace	trace
5	88.59	Over 10.0	10.4	trace	0.48
6	89.13	Over 6.0	7.0	3.33	trace
7	87.73	Over 5.0	7.5	1.58	2.71
8	87.47	Over 5.0	5.4	5.06	1.56
9	78.24	Over 10.0	10.2	3.12	7.98
10	87.07	Over 6.0	7.1	1.94	3.37
11	82.69	Over 6.0	5.8	2.93	8.12

*Identifications*

- 1- 2. Sestertii of Antoninus Pius
3. Dupondius of Antoninus Pius
- 4- 7. Sestertii of Marcus Aurelius
- 8- 9. Dupondii of Marcus Aurelius
- 10-11. Sestertii of Commodus

Among the many Roman coins of the early empire examined spectrographically in the laboratory of the British Non-Ferrous Metals Research Association at the request of Grant,<sup>81</sup> seven were found to contain enough zinc to be classed as orichalcum coins. However, these analyses were at best semi-quantitative, and no exact figures for the

<sup>81</sup> Grant, M., *From Imperium to Auctoritas* (Cambridge, 1946), p. 493.

proportions of zinc, or for the proportions of the other components of the alloys were obtained. Though such analyses may be very useful for the classification of coins, they contribute nothing toward an exact knowledge of the composition of ancient coinage alloys.

Very few of the orichalcum coins which have been analyzed in the past have been adequately described or closely dated, and at least half of the chemical analyses are inaccurate, incomplete, or both. No example exists of a fully described coin that has been carefully analyzed. Obviously, what is needed for an exact knowledge of the composition of orichalcum, and especially for an exact knowledge of the changes in its composition with time, are satisfactory chemical analyses of a long series of adequately described and closely dated coins.

## V. NEW ANALYSES OF ORICHALCUM COINS

The unsatisfactory state of our knowledge of the composition of orichalcum coins based on previous analyses has been remedied to a considerable extent by the careful analyses of twenty-five representative and adequately identified coins of this class executed in the author's laboratory by various students within the past twenty-five years. Ten of these coins were duplicates from the collections of the American Numismatic Society and were kindly supplied for analysis by Dr. George C. Miles, Chief Curator. The others were purchased by the author from various dealers at various times. Table XVI contains a descriptive list of the coins analyzed. The names of the analysts, to whom the author is much indebted for their painstaking work, are given at the end of the descriptions in order of the extent of their contributions.

TABLE XVI

### LIST OF COINS ANALYZED

1. Emperor = Augustus                      Denomination = Dupondius  
 Date = 23 B.C. (Mattingly) or 19-16 B.C. (Grant)  
 Weight = 12.4 grams    Size = 26-27 mm.    Condition = Fine  
*Obv.*: AVGVSTVS                      in three lines  
          TRIBVNIC                      in oak-wreath.  
          PTEST  
*Rev.*: L · SVRDINVS · IIIVIR · A · A · A · F · F · around S C.  
*Ref.* BMC, Vol. I, p. 30, No. 141, pl. 19, No. 2.  
 Analyst: W. H. Deebel.
2. Emperor = Augustus                      Denomination = Sestertius  
 Date = 22 B.C. (Mattingly) or 19-16 B.C. (Grant)  
 Weight = 20.6 grams    Size = 33-34 mm.    Condition = Good  
*Obv.*: Oak-wreath between laurel branches  
          OB                      above wreath  
          CIVIS                      within wreath  
          SERVATOS                      below wreath  
*Rev.*: C · ASINIVS · C · F · GALLVS · III · VIR · A · A · A · F · F ·  
          S C                      large in center  
*Ref.* BMC, Vol. I, p. 32, No. 157.  
 Analysts: M. C. Suarez, D. Loyer, D. Perez and J. Fratz.

3. Emperor = Tiberius Denomination = Dupondius  
Date = A.D. 22-23 Condition = Good, but patinated and worn  
Weight = 11.8 grams Size = 28-29 mm.  
*Obv.*: TI · CAESAR · DIVI · AVG · F · AVG · P · M · TR · POT · XXIIII  
starting at top. S C large in center.  
*Rev.*: Bust of Livia as Justitia(?), draped r., wearing stephane ornamented with floral ornaments; her hair fastened in a knot at the back. IVSTITIA below bust, outwardly.  
*Ref.* BMC, Vol. I, p. 131, No. 79 or 80.  
Analysts: M. C. Suarez, T. Hutt, D. Loyer, D. Perez and J. Fratz.
4. Emperor = Caligula Denomination = Dupondius  
Date = A.D. 37-41 Condition = Good  
Weight = 12.2 grams Size = 28-29 mm.  
*Obv.*: Head of Augustus, radiate, l.  
DIVVS AVGVSTVS in arc above.  
S C l. and r. in field.  
*Rev.*: Augustus, laureate, togate, seated l. on curule chair, holding branch in r. hand and resting l. hand against side.  
CONSENSV · SENAT · ET · EQ · ORDIN · P · Q · R starting low l.  
*Ref.* BMC, Vol. I, p. 160, Nos. 88-91.  
Analysts: M. C. Suarez, T. Hutt, D. Perez, D. Loyer and J. Fratz.
5. Emperor = Caligula Denomination = Sestertius  
Date = A.D. 37-38 Condition = Fair, but holed and corroded  
Weight = 25.8 grams Size = 35-36 mm.  
*Obv.*: Head of Caligula, laureate, l.  
C · CAESAR · AVG · GERMANICVS · PON · M · TR · POT ·  
starting low l.  
*Rev.*: [S · P · Q · R]  
P P in four lines in an oak-wreath.  
OB CIVES  
SERVATOS  
*Ref.* BMC, Vol. I, p. 152, No. 38 or 39.  
Analysts: M. C. Suarez and T. Hutt.
6. Emperor = Caligula Denomination = Sestertius  
Date = A.D. 39-40 Condition = Poor (much worn and corroded)  
Weight = 25.4 grams Size = 35 mm.  
*Obv.*: Head of Caligula, laureate, l.  
[C · CAESAR · DIV]I · AVG · PRON · [AVG · P · M · TR · P.]  
III [P · P]

*Rev.*: Caligula, bare-headed, togate, standing l. on a low platform on r., extending r. hand in gesture of address; behind him on platform a low chair. In front of him stand five soldiers r., all helmeted, holding shields and parazonia; the foremost soldier stands alone, the other four in two files, and each of these carries an aquila. Inscription illegible.

*Ref.* BMC, Vol. I, p. 156, No. \*, pl. 28, No. 7.

Analysts: B. Becker and N. Lovegren.

7. Emperor = Caligula Denomination = Sestertius  
Date = A.D. 39–40 Condition = Fair  
Weight = 23.8 grams Size = 34–35 mm.

*Obv.*: Head of Caligula, laureate, l.

C · CAESAR · DIVI · AVG · PRON · AVG · P · M · TR · P · III ·  
P · P ·

*Rev.*: S · P · Q · R

P · P

in an oak-wreath.

OB · CIVES

SERVATOS

*Ref.* BMC, Vol. I, p. 156, No. 58, pl. 28, No. 8.

Analysts: W. H. Deebel, D. Loyer, D. Perez and J. Fratz.

8. Emperor = Claudius Denomination = Sestertius  
Date = A.D. 41 Condition = Fair  
Weight = 22.7 grams Size = 34–35 mm.

*Obv.*: Head of Claudius, laureate, r.

TI · CLAUDIVS · CAESAR · AVG · P · M · TRP · IMP ·

*Rev.*: EX · S · C

O B

in an oak-wreath.

CIVES

SERVATOS

*Ref.* BMC Vol. I, p. 181, No. 115, pl. 34, No. 9.

Analysts: W. H. Deebel, T. Hutt, D. Perez, D. Loyer and J. Fratz.

9. Emperor = Claudius Denomination = Dupondius  
Date = A.D. 41 Condition = Fair, but corroded  
Weight = 12.4 grams Size = 27–29 mm.

*Obv.*: Bust of Antonia, draped r., head bare, hair fastened in long plait at back.

ANTONIA A[VGVSTA] off flan. l. up, r. down.

*Rev.*: Claudius, togate, veiled, standing l., holding simpulum in r. hand and resting l. hand on his side.

TI · [CLAUDIVS · CAESAR · AVG ·] P · M · TR · P · IMP ·

partly off flan, starting low left.

S C l. and r., low in field.

*Ref.* BMC, Vol. I, p. 188, No. 166.

Analysts: M. C. Suarez, T. Hutt, D. Loyer, D. Perez and J. Fratz.



10. Emperor = Nero Denomination = Dupondius  
 Date = A.D. 64–66 Condition = Good, but corroded  
 Weight = 12.4 grams Size = 27–29 mm.  
*Obv.*: Head of Nero, radiate, l.  
 NERO CLAVDIVS CAESAR AUG GER PM TRP IMP PP.  
*Rev.*: View of Temple of Janus, showing one front and one side. Left-hand side shown.  
 PACE P · R · TERRA MARIQ · PARTA IANVM CLVSIT  
 S C l. and r. in field.  
*Ref.* BMC, Vol. I, p. 238, No. 200.  
 Analyst: M. C. Suarez.
11. Emperor = Nero Denomination = Dupondius  
 Date = A.D. 64–66 Condition = Good  
 Weight = 17.9 grams Size = 29 mm.  
 Mint = Rome  
*Obv.*: Head of Nero, radiate, r.  
 NEROCLAVDCAESARGERPMTRPIMP  
*Rev.*: Victory, draped, striding l., holding wreath in r. hand and palm in l.  
 VICTORIA AVGVSTI l. up, r. down.  
 S C l. and r. in field. II in ex.  
*Ref.* BMC, Vol. I, pp. 241–42, Nos. 214–16 (Type E).  
 Analysts: R. L. Wicinski, T. Hutt, D. Loyer, D. Perez and J. Fratz.
12. Emperor = Nero Denomination = Dupondius  
 Date = A.D. 66–67 Condition = Very good  
 Weight = 12.1 grams Size = 30 mm.  
 Mint = Lugdunum  
*Obv.*: Head of Nero, laureate, r.  
 IMPNEROCAESARAVGPMAXTRPPP  
*Rev.*: Victory, draped, advancing l., holding wreath in r. hand and palm in l.  
 VICTORIA AVGVSTI l. up, r. down.  
 S C l. and r. in field.  
*Ref.* BMC, Vol. I, pp. 269–70, Nos. 353–55 (Type D).  
 Analyst: R. L. Wicinski.
13. Emperor = Nerva Denomination = Dupondius  
 Date = A.D. 97 Condition = Good  
 Weight = 11.5 grams Size = 26 mm.  
*Obv.*: Head of Nerva, radiate, r.  
 IMPNERVACAESAVG PMTRPCOSIIIPP  
*Rev.*: Fortuna, draped, standing l., holding rudder on ground in r. hand and cornu copiae in l.  
 FORTVN[A AVGV]ST  
 S C l. and r., in field.

*Ref.* BMC, Vol. III, p. 22, Nos. 123–25.

Analysts: M. C. Suarez and T. Hutt.

14. Emperor = Nerva                      Denomination = Dupondius  
 Date = A.D. 96–98                      Condition = Good  
 Weight = 12.7 grams    Size = 27 mm.  
*Obv.*: Head of Divus Augustus, radiate, r.  
          [DIVVS] AVGVSTVS  
*Rev.*: Rudder upright, over globe.  
          IMP NERVA CAES AVG REST  
          S C in exergue.

*Ref.* BMC, Vol. III, p. 29, No. 154, pl. 8, No. 2.

Analysts: A. Randall and N. Lovegren.

15. Emperor = Trajan                      Denomination = Dupondius  
 Date = A.D. 98–100                      Condition = Poor (corroded and worn)  
 Weight = 10.0 grams    Size = 26–27 mm.  
*Obv.*: Head of Trajan, radiate, r.  
          IMP CAES NERVA TRAIAN AVG [.....]  
*Rev.*: Woman (Justitia?) seated l. on a throne with cornua copiae as arms, holding vertical sceptre in r. hand, l. hand on lap, fold of drapery falling over lap.  
          [.....] COS [...]  
          [...] in exergue.

*Ref.* BMC, Vol. III, p. 149, No. 719 or p. 152, No. 734.

Analyst: M. C. Suarez.

16. Emperor = Trajan                      Denomination = Dupondius  
 Date = A.D. 98–100                      Condition = Fair  
 Weight = 11.1 grams    Size = 26–28 mm.  
*Obv.*: Head of Trajan, radiate, r.  
          IMP CAES NERVA TRAIAN AVG GERM PM  
*Rev.*: Woman (Justitia?) seated l. on a throne with cornua copiae as arms, holding vertical sceptre in r. hand, l. hand on lap, fold of drapery falling over lap.  
          TR POT COS[...]  
          S C in exergue.

*Ref.* BMC, Vol. III, p. 149, No. 719 or p. 152, No. 734.

Analysts: M. C. Suarez and T. Hutt.

17. Emperor = Trajan                      Denomination = Sestertius  
 Date = A.D. 116–117                      Size = 34 mm.  
 Condition = Poor (most of right half broken off, remainder bent).  
*Obv.*: Bust of Trajan, draped, laureate, r.  
          IMP CAES NER TRIANO OPTIMO AVG GER DA [.....].  
*Rev.*: Providentia draped.  
          PROVIDENTIA [.....].

*Ref.* BMC, Vol. III, p. 222, No. 1041.

Analysts: M. C. Suarez, T. Hutt, D. Perez, D. Loyer and J. Fratz.

18. Emperor = Trajan                      Denomination = Dupondius

Date = A.D. 112–114(?)                      Condition = Fair

Weight = 10.2 grams                      Size = 26 mm.

*Obv.*: Bust of Trajan, radiate, draped, r.

IMP CAES NERVAE TRAIANO

AVG GER DAC PM TRP COS VI PP

*Rev.*: Column of Trajan.

S C (large) l. and r. in field.

Legend illegible.

*Ref.* BMC, Vol. III, p. 210, No. 994, pl. 39, No. 4.

Analysts: P. E. Machemer and N. Lovegren.

19. Emperor = Antoninus Pius                      Denomination = Sestertius

Date = A.D. 141 or shortly after.                      Condition = Fair

Weight = 25.4 grams.                      Size = 31–32 mm.

*Obv.*: Bust of Faustina, draped, r.

DIVA AVGVSTA FAVSTINA

*Rev.*: Pietas standing l., dropping incense on candelabrum and holding box of perfumes.

PIETAS AVG                      In field, S C

*Ref.* BMC, Vol. IV, p. 233, Nos. 1447–1448.

RIC, No. 1146 A.

Analysts: W. H. Deebel, D. Loyer, D. Perez and J. Fratz.

20. Emperor = Antoninus Pius                      Denomination = Dupondius

Date = A.D. 141 or shortly after.                      Condition = Fair/Poor.

Weight = 11.2 grams.                      Size = 24–26 mm.

*Obv.*: Bust of Faustina, draped, r.

DIVA AVGVSTA FAVSTINA

*Rev.*: Pietas standing l., dropping incense on candelabrum and holding box of perfumes.

PIETAS AVG                      In field, S C

*Ref.* BMC, Vol. IV, p. 236, No. 1468.

RIC, No. 1192 A.

Analyst: W. H. Deebel.

21. Emperor = Antoninus Pius                      Denomination = Dupondius

Date = A.D. 154–155                      Condition = Fair/Poor

Weight = 12.6 grams.                      Size = 25–26 mm.

*Obv.*: Head of Antoninus Pius, radiate, r.

ANTONINVS AVG PIVS PP TRP XVIII

*Rev.*: Libertas standing r., holding pileus and sceptre.

LIBERTAS COS IIII                      In field, S C

*Ref.* BMC, Vol. IV, p. 330, No. 1969; pl. 48, No. 17 (reverse only).

Analysts: W. H. Deebel, T. Hutt, D. Loyer, D. Perez and J. Fratz.

22. Emperor = Antoninus Pius      Denomination = Dupondius  
 Date = A.D. 154–155      Condition = Fair/Poor  
 Weight = 13.9 grams      Size = 25–26 mm.  
*Obv.*: Head of Antoninus Pius, radiate, r.  
 ANTONINVS AVG PIVS PP TRP XVIII  
*Rev.*: Libertas standing r., holding pileus and extending r. hand.  
 LIBERTAS COS IIII      In field, S C  
*Ref.* *BMC*, Vol. IV, p. 330, No. 1967.  
 Analysts: W. H. Deebel, D. Perez, D. Loyer and J. Fratz.
23. Emperor = Marcus Aurelius      Denomination = Sestertius  
 Date = A.D. 162–163      Condition = Fair/Poor  
 Weight = 22.6 grams.      Size = 30–31 mm.  
*Obv.*: Head of Marcus Aurelius, laureate, r.  
 IMP CAES M AVREL ANTONINVS AVG PM  
*Rev.*: Salus standing l., feeding snake twined around altar.  
 SALVTI AVGVSTOR TRP XVII COS III  
 In field, S C  
*Ref.* *BMC*, Vol. IV, p. 550, No. 1037.  
*RIC*, No. 843.  
 Analysts: W. H. Deebel, D. Perez, D. Loyer and J. Fratz.
24. Emperor = Marcus Aurelius      Denomination = Dupondius  
 Date = A.D. 161–162      Condition = Poor  
 Weight = 12.0 grams.      Size = 24–26 mm.  
*Obv.*: Head of Marcus Aurelius, radiate, r.  
 IMP CAES M AVREL ANTONINVS AVG PM  
*Rev.*: Marcus Aurelius and Lucius Verus standing with clasped hands.  
 Aurelius holds a scroll.  
 CONCORD AVGVSTOR TRP XVI COS III  
 In field, S C  
*Ref.* *BMC*, Vol. IV, p. 547, No. 1016, pl. 75, No. 1.  
*RIC*, No. 828.  
 Analysts: W. H. Deebel, T. Hutt, D. Loyer, D. Perez and J. Fratz.
25. Emperor = Commodus      Denomination = Dupondius  
 Date = A.D. 179      Condition = Good/Fair  
 Weight = 12.9 grams.      Size = 24–26 mm.  
*Obv.*: Head of Commodus, radiate, r.  
 L AVREL COMMODVS AVG TRP IIII  
*Rev.*: Victory advancing l., holding wreath and palm  
 IMP III COS II PP      In field, S C  
*Ref.* *BMC*, Vol. IV, p. 680, No. 1708  
*RIC*, No. 1614  
 Analysts: W. H. Deebel, T. Hutt, D. Loyer, D. Perez and J. Fratz.

Six of the coins (Nos. 2, 7, 8, 19, 22 and 23) were examined by X-ray fluorescence analysis in the hope that a method could be used that would not damage the coins. This hope was not realized since the examination of different areas of the untreated surfaces of the coins yielded very discordant results for both the major and minor components of the alloys. This is understandable in view of the visually heterogeneous character of most of these surfaces. Reproducible quantitative results by this method of analysis can be obtained only if the X-ray beam is directed on plane and smooth metal surfaces that have been carefully prepared so as to resemble very closely the surfaces of the reference standards. Even when one surface of each of the coins was ground smooth and polished, the results were inferior in precision, accuracy, and completeness to those obtainable by chemical methods of analysis. The author is indebted to Mr. J. Manchester and the late Professor W. MacNevin for assistance in the attempts to apply X-ray fluorescence analysis to the determination of the composition of orichalcum coins.

In sampling the coins for chemical analysis, the usual procedure was to remove with a clean file all the corroded surface metal and a sufficient layer of metal below the surface to obtain a blank of metal that was free from visible corrosion and which was presumably of the same composition as the original metal. Sometimes cracks had to be cleaned out with a file or saw, and local pits of corroded metal with a drill. Sectors of clean metal that weighed about a gram were then cut from these blanks with a clean saw. At least two sectors from each blank were analyzed for all the usual components. Often additional sectors were taken for the purpose of checking determinations when doubt arose as to their correctness, or for the purpose of making special tests or determinations. For exact analysis this method of destructive sampling is much to be preferred to the removal of small samples from the edge or faces of a coin, for such small samples are very likely not to be truly representative of the composition of the original alloy, especially with orichalcum coins. Indeed, by reason of selective corrosion, the surface metal of some orichalcum coins has been found to be nearly free from zinc, so that the analysis of small samples taken from the surface of such coins would yield very deceptive results.

The outline of the analytical procedure which follows is intended only to indicate the general scheme that was used so that its validity may be judged. Most of the necessary manipulative details have been omitted since these are to be found in the standard works on chemical analysis.

Accurately weighed samples of about a gram were treated with nitric acid for the separation of the gold and tin from the other metals. The ignited and weighed residue from the nitric acid treatment was extracted with cold, dilute aqua regia to dissolve the gold, and the resultant solution was treated with either ferrous sulfate solution or oxalic acid solution to precipitate the gold. Only a trace of gold was usually found, but when a weighable amount was present this was collected on filter paper, ignited, and weighed. By subtracting the weight of gold from the weight of the residue, the weight of stannic oxide was obtained, from which the weight of the tin was calculated. When the light color of the nitric acid residue showed that gold was absent, the treatment with aqua regia was omitted, and the weight of the tin was calculated directly from the weight of the residue.

The filtrate from the separation of the tin, or both tin and gold, was treated with hydrochloric acid solution to precipitate silver as the chloride. The silver chloride was collected in a weighed filter crucible, and, after drying and weighing, the weight of the silver chloride was found, from which the weight of the silver was calculated. The filtrate from the separation of the silver was treated with sulfuric acid, and the solution was evaporated until fumes of sulfur trioxide appeared. After cooling, the residue was treated with water, and the lead sulfate was collected in a weighed filter crucible, dried and weighed. Copper was determined by electrolysis in the filtrate from the separation of the lead, and from the weight of the small amount of lead dioxide deposited on the anode, and the weight of the lead sulfate, the total lead content was calculated. The filtrate from the separation of the copper and residual lead was evaporated to a small volume and treated with ammonium hydroxide solution to precipitate the iron. The precipitate was collected on filter paper and ignited to ferric oxide in a weighed crucible, the amount of iron being found from the weight of this oxide. In the filtrate from the separation of the iron, nickel was precipitated with dimethylglyoxime solution. The precipitate was col-

lected in a weighed filter crucible, dried and weighed, and the amount of nickel was calculated from the weight of this precipitate. After treatment of the filtrate from the separation of the nickel with nitric acid to destroy organic matter and remove the excess of ammonium salts, the resultant solution was diluted, neutralized, and treated with ammonium phosphate solution to precipitate the zinc. The precipitate was collected in a weighed filter crucible and dried or ignited to obtain a residue of zinc phosphate suitable for weighing. The amount of zinc was calculated from the weight of the zinc phosphate.

Most of the coins were examined for the presence of arsenic and sulfur, separate samples being used for this purpose. Some of the same samples used for arsenic were tested for the presence of antimony. Arsenic was determined by first treating a weighed sample with concentrated nitric acid until decomposed. Concentrated sulfuric acid was then added and the solution was evaporated until all the nitric acid and nitrates were removed. This solution was diluted with water and transferred to a distilling flask provided with a dropping funnel and connected with a condenser and a receiving flask provided with a series of traps. Solid ferrous sulfate or a solution of hypophosphorous acid was added to the solution in the distilling flask, the dropping funnel was filled with concentrated hydrochloric acid, and the proper volumes of water placed in the receiver and traps. The solution of the sample was then distilled with the frequent addition of acid from the dropping funnel. When most of the solution had distilled over and the temperature of the vapor had reached  $108^{\circ}\text{C}$  the distillation was stopped. The liquid in the receiver and traps was flushed into a flask, and the arsenic was precipitated with a stream of hydrogen sulfide gas. The precipitate of arsenious sulfide, more or less contaminated with sulfur, was collected in a weighed filter crucible, dried and weighed. After treatment of the dried precipitate with ammonium hydroxide solution to dissolve out the sulfide, the crucible with its residual sulfur was again dried and weighed to find the weight of pure arsenious sulfide by difference. The amount of arsenic was calculated from this weight. Concentrated phosphoric acid was then added to the solution remaining in the distillation flask, and the process of distillation was repeated at a higher temperature. The liquid in the receiver and traps was treated with hydrogen sulfide gas for the detection of antimony, but it

was not found by this test in any of the samples. Sulfur was determined by first treating a weighed sample with concentrated nitric acid, evaporating to small volume, diluting with water, and filtering to remove any residue. The filtrate was evaporated nearly to dryness twice with concentrated hydrochloric acid and diluted with water. Any precipitate of silver chloride was removed by filtration, and the clear solution was treated with barium chloride solution to precipitate sulfur as barium sulfate, which was filtered off in a weighed filter crucible, washed, dried and weighed. If the dried precipitate was not entirely white, it was dissolved out of the crucible by treatment with successive small volumes of concentrated sulfuric acid, and the resultant solution was allowed to flow into water to reprecipitate the barium sulfate. The purified precipitate was collected in a weighed filter crucible, washed, dried and weighed as before. The amount of sulfur was calculated from the weight of either the original or the purified precipitate.<sup>82</sup>

Samples from eight of the coins (Nos. 2, 4, 5, 7, 8, 19, 23 and 24) were examined spectrographically for very small proportions of minor components that may have escaped detection by the above procedure, and for elements which might not be detected at all by this procedure. The samples, each of which weighed 10 milligrams, were examined both by direct vaporization in the carbon arc and by vaporization of their solutions in aqua regia first absorbed in the electrodes. An alternating current arc was used, and the spectral range was from 2130 to 4350 Angstrom units. For the estimation of any elements found qualitatively, the semi-quantitative method of Harvey<sup>83</sup> was used. The author is indebted to Mrs. Nulifer I. Woods, a graduate student, for all of the spectrographic results.

The results of the analyses are shown in Tables XVII and XVIII. Each result in Table XVII, except for the totals of the minor components and the summations, is the average of two or more separate determinations which nearly always agreed closely with one another. With a few exceptions each result shown in Table XVIII is also the

<sup>82</sup> A detailed procedure for the determination of sulfur in ancient brass is given by Caley, E. R., *Ohio Journal of Science*, LXI (1961), pp. 151-154.

<sup>83</sup> Harvey, C. E., *A Method of Semi-Quantitative Spectrographic Analysis* (Glendale, California, 1947).



average of at least two determinations. The minus signs in this table indicate that determinations of the given elements were not made. Most of the summations are sufficiently close to 100.00% to indicate that all the elements present in significant proportion were determined. The totals for Nos. 10 and 12 may be low because of the presence of undetermined arsenic and sulfur, though it appears more likely that the deficiencies are due to the presence of undetermined oxygen, which was undoubtedly present to some extent in the form of metal oxides in all the coins. The high summations (i.e., over 100.00%) arise from positive experimental errors in the determinations and

TABLE XVII

## NEW ANALYSES OF ORICHALCUM COINS-PRINCIPAL COMPONENTS

Coin No.	Copper %	Zinc %	Tin %	Lead %	Other Components %	Total %
1	77.36	21.88	0.17	0.16	0.41	99.98
2	76.70	22.02	0.27	0.37	0.57	99.93
3	76.86	22.85	0.03	0.04	0.29	100.07
4	72.63	26.71	0.02	0.16	0.52	100.04
5	77.52	22.20	0.04	0.01	0.32	100.09
6	78.19	21.11	0.12	0.04	0.39	99.85
7	81.03	18.55	none	0.05	0.25	99.88
8	75.91	23.20	0.09	0.12	0.74	100.05
9	77.59	21.11	0.10	0.83	0.54	100.17
10	83.16	15.95	0.01	0.13	0.49	99.74
11	77.27	22.46	none	0.15	0.29	100.17
12	78.24	20.98	none	0.14	0.29	99.65
13	83.60	14.82	0.70	0.54	0.52	100.18
14	84.69	13.59	0.57	0.49	0.45	99.79
15	81.21	17.76	0.02	0.37	0.49	99.85
16	83.48	16.01	0.02	0.10	0.33	99.94
17	82.08	14.10	2.05	1.29	0.61	100.13
18	76.83	14.45	4.34	4.33	0.19	100.14
19	86.79	12.33	none	0.13	0.84	100.09
20	86.28	12.71	0.06	0.32	0.59	99.96
21	86.51	11.14	1.69	0.11	0.73	100.18
22	89.29	9.38	0.16	0.35	0.97	100.15
23	87.86	9.06	2.03	0.23	0.87	100.05
24	88.96	7.87	2.33	0.18	0.88	100.22
25	86.85	6.43	1.64	4.28	0.86	100.06

from the introduction of slight amounts of foreign matter in the course of the analyses. The average of all the summations is 100.01% which indicates a very satisfactory degree of accuracy for the analyses as a whole.

TABLE XVIII

## NEW ANALYSES OF ORICHALCUM COINS-MINOR COMPONENTS

<i>Coin No.</i>	<i>Iron %</i>	<i>Nickel %</i>	<i>Silver %</i>	<i>Gold %</i>	<i>Arsenic %</i>	<i>Sulfur %</i>	<i>Total %</i>
1	0.38	none	none	none	—	0.03	0.41
2	0.49	0.04	0.04	none	trace	none	0.57
3	0.26	0.03	none	none	none	none	0.29
4	0.44	0.01	0.03	none	0.04	—	0.52
5	0.27	0.03	trace	none	0.02	none	0.32
6	0.39	none	none	none	none	none	0.39
7	0.22	0.03	trace	none	none	none	0.25
8	0.67	0.02	0.01	trace	0.04	none	0.74
9	0.47	0.02	0.03	trace	0.02	none	0.54
10	0.40	0.03	0.06	none	—	—	0.49
11	0.16	none	0.08	—	0.05	none	0.29
12	0.24	trace	0.05	—	—	—	0.29
13	0.46	0.03	none	trace	0.03	—	0.52
14	0.38	0.05	none	none	0.02	none	0.45
15	0.30	0.04	0.08	none	0.07	—	0.49
16	0.26	0.04	0.03	trace	—	—	0.33
17	0.37	0.04	0.09	none	0.03	0.08	0.61
18	0.12	0.04	0.03	—	none	none	0.19
19	0.58	0.03	0.01	0.04	0.06	0.12	0.84
20	0.51	0.02	0.06	trace	—	—	0.59
21	0.33	0.03	0.10	trace	0.10	0.17	0.73
22	0.55	0.04	0.05	trace	0.12	0.21	0.97
23	0.33	0.03	0.10	none	0.08	0.28	0.87
24	0.31	0.04	0.05	trace	0.21	0.17	0.88
25	0.28	0.06	0.07	trace	0.13	0.32	0.86

*Notes*

- a. Cobalt was not found by chemical tests in Nos. 6, 13 and 18, and was not found spectrographically in Nos. 2, 4, 5 and 7. A trace was found by chemical test in No. 25, and slight traces were found spectrographically in Nos. 8 and 19. Nos. 23 and 24 were each found spectrographically to contain a trace of cobalt estimated to amount to 0.001%. The other coins were not tested for the presence of cobalt.

- b. Silver was not found in No. 5 by chemical test, but a trace estimated to amount to 0.006% was found spectrographically. Similarly, none was found in No. 7 by chemical test, but a trace estimated to amount to 0.008% was found spectrographically.
- c. Arsenic was not found by chemical test in No. 2, but a trace estimated to amount to 0.007% was found spectrographically. The absence of arsenic from No. 7, indicated by chemical test, was confirmed spectrographically.
- d. Antimony was found by chemical test to be absent from Nos. 3, 9, 11, 13, 15, 17, 21 and 25, and absent from Nos. 4 and 5 both by chemical test and spectrographically. Nos. 7, 8 and 19 were each found spectrographically to contain about 0.01%. No. 23 was found spectrographically to contain about 0.05%, and No. 24 about 0.10%. The other coins were not tested for the presence of antimony.
- e. Bismuth was found spectrographically in faint traces in Nos. 8 and 19 when the samples consisted of metal particles but not when solutions of samples were tested. It was not found spectrographically in Nos. 2, 4, 5, 7, 23 and 24. The other coins were not tested for the presence of bismuth.

Many of the results for copper and zinc shown in Table XVII differ decidedly from those found by previous analyses, the proportions of copper being generally lower and the proportions of zinc generally higher for the coins of any given emperor. For example, the average figures for the copper and zinc content of the coins of Augustus in Table XVII are 77.03% and 21.55%, respectively, whereas the corresponding average figures for all previous analyses are 82.3% and 17.0%. In view of the complexity of the coinage of Augustus the differences between these sets of figures might be ascribed entirely to the analysis of coins of widely different class or type by the several analysts, but similar differences, usually less in degree, exist between the results of these new analyses and the results of previous analyses for the coins of most of the other emperors. For example, the average proportions of copper and zinc in the four coins of Caligula of Table XVII are 77.34% and 22.14%, respectively, whereas the corresponding figures for the two previous analyses are 79.8% and 20.2%. In Table XIX are shown for comparison the average percentages of copper and zinc, according to the best previous analyses and these new analyses, in orichalcum coins of the first century A.D. that were issued during the reigns of Tiberius to Nerva, inclusive; a range of time of issue here designated as Period I. It will be seen that the average results for the

copper content differ by more than 4% and that the average results for the zinc content differ by almost 5%. The differences between the results of previous analyses and the results of these new analyses for the copper and zinc content of coins issued in the second century A.D. are generally smaller, as is indicated by the comparison of the average results shown in Table XIX for orichalcum coins issued during the reigns of the emperors from Trajan to Commodus inclusive; a range of time of issue here designated as Period II. It will be seen that the copper content differs by only a little more than 1% and the zinc content by a little less than 2%. Nevertheless, for the coins of this period also, the copper content is definitely lower and the zinc content definitely higher according to these new analyses. Though intrinsic differences undoubtedly existed between the composition of coins of given emperors taken for the earlier analyses and these new analyses, this does not seem a sufficient cause for the general lack of agreement between the earlier results and the new results for the percentages of copper and zinc, especially since this lack of agreement is in the same direction over the entire time of issue. Nor does it seem likely that this lack of agreement can be ascribed to differences in the methods of analysis or skill of the analysts. The most likely cause appears to be differences in the care taken in the preparation of samples for analysis. Most of the previous analysts say nothing about their method of sampling, from which it would seem likely that little attention was paid to this important matter. If they had taken their samples merely by cutting pieces from uncleaned coins, or if they had failed to remove much of the corroded metal from the pieces they analyzed, this would account for the observed lack of agreement, for the corrosion products of orichalcum coins contain a higher proportion of copper and a lower proportion of zinc than the uncorroded metal. Bibra, who analyzed more orichalcum coins than any other single investigator, does indeed describe his method of sampling, but it is evident from his description that his method was faulty.<sup>84</sup> He customarily removed the corrosion products from the metal objects he analyzed by means of concentrated ammonium hydroxide solution or concentrated nitric acid. This chemical cleaning method when applied to orichalcum coins must have

<sup>84</sup> Bibra, E. von, *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 1-2.

tended to some extent to dissolve out the zinc preferentially from the surface, and consequently he obtained slightly high results for the copper content and slightly low results for the zinc content of the samples he analyzed. By reason of a better method of sampling, if for no other reason, the new results shown in Table XVII for the copper and zinc content of orichalcum coins are closer to the truth than previous results for these principal components.

TABLE XIX

COMPARISON OF RESULTS OF PREVIOUS ANALYSES WITH RESULTS OF NEW ANALYSES IN RESPECT TO AVERAGE COPPER AND ZINC CONTENT OF ORICHALCUM COINS OF TWO MAJOR PERIODS

<i>Group of Analyses</i>	<i>Number of Analyses</i>	<i>Period</i>	<i>Copper %</i>	<i>Zinc %</i>
<i>Previous</i>	9	I	83.10	15.34
<i>New</i>	12	I	78.89	20.29
<i>Previous</i>	25	II	86.22	10.05
<i>New</i>	11	II	85.10	11.93

The results in Table XVII for the tin and lead content of orichalcum coins of the same emperor or successive emperors will be seen to vary in an erratic way, the only distinct trend being that the higher percentages of both metals usually occur in the coins of the later emperors. In these respects the result of these new analyses agree with the results of previous analyses, though there are differences in the average percentages of tin and lead as shown by the figures in Table XX. The average of previous results for coins of Period I is based only on the analyses published by Bibra and by Helm (Tables X and XI) since other previous analysts either report no results for the tin or lead content of the coins they analyzed or report results of very questionable accuracy. It will be seen that the average of previous results for the tin content of coins of this period is considerably higher than the average of the new results, and that the average of the previous results for the lead content is slightly lower. If one apparently atypical set of results obtained by Bibra (Table X, No. 9) had been included in computing the average tin content from previous analyses, this average would have been 0.94% as compared to the 0.14% found by the new analyses, and the average lead content would

have been 0.24%, almost identical with the average of the new results for Period I. For the coins of Period II the average tin content computed from the results of previous analyses is also much higher than the average of the results of these new analyses, and the average lead content is distinctly lower. These differences between the averages of the previous results and the new results for the tin content of orichalcum coins may also be explained to a large extent from the differences in care exercised in sampling coins for analysis. The inclusion of some corrosion products in samples taken for analysis, which appears to have been the practice of some of the previous analysts, would yield high results for tin, not only because tin as the insoluble oxide would be present in higher proportion in these corrosion products than in the alloy itself, but because other insoluble matter such as clay and sand trapped in the corrosion products would remain with the tin oxide formed on treating the alloy with nitric acid for analysis and would be weighed along with this oxide. The lower average proportions of lead found by previous analysts is probably due only in part to differences in care exercised in sampling. To some extent this lower proportion may be ascribed to an error in the method of determining the lead. Apparently all the analysts separated and determined the lead as sulfate in aqueous solution but did not correct for the lead sulfate remaining in solution. In the procedure used for these new analyses the lead remaining in solution was recovered and determined electrolytically, so that all the lead was determined.

TABLE XX

COMPARISON OF RESULTS OF PREVIOUS ANALYSES WITH RESULTS OF NEW ANALYSES IN RESPECT TO AVERAGE TIN AND LEAD CONTENT OF ORICHALCUM COINS OF TWO MAJOR PERIODS

<i>Group of Analyses</i>	<i>Number of Analyses</i>	<i>Period</i>	<i>Tin %</i>	<i>Lead %</i>
<i>Previous</i>	5	I	0.49	0.15
<i>New</i>	12	I	0.14	0.23
<i>Previous</i>	21	II	2.20	0.65
<i>New</i>	11	II	1.30	1.06

As will be seen from Table XVIII, iron was found to be present in small proportions in all the orichalcum coins that were analyzed.

;

Genth, Bibra, and Helm (Tables IX, X, and XI, respectively) also report iron to be an invariable component of such coins. Other previous analysts either do not report iron as being present, or report it as being present only in some of the coins they analyzed. Apparently they did not attempt its determination in the coins for which no results are reported. As shown in Table XVIII, the proportions of iron found by these new analyses range from 0.12% to 0.67%. The proportions found by Genth and by Helm all fall within this range, but nearly a third of the results reported by Bibra fall outside of it. A comparison of the distribution of the results reported by Bibra with the distribution of the results of the new analyses is given in Table XXI. Since iron appears to be a purely accidental impurity in orichalcum, the approximately equal distribution of the results of a series of determinations around a central point, as found by these new analyses, seems inherently more likely. Moreover, a comparison of all the known results for the iron content of the orichalcum coins of a given emperor, as shown by the example in Table XXII, indicates that Bibra's results for iron are not accurate. Further comparisons of the results obtained by Bibra with the results of the new analyses are shown in

TABLE XXI

## DISTRIBUTION OF IRON CONTENT OF ORICHALCUM COINS

<i>Iron Content %</i>	<i>Number in Range</i>	
	<i>As Reported by Bibra</i>	<i>According to New Analyses</i>
0.01-0.10	1	0
0.11-0.20	4	2
0.21-0.30	0	7
0.31-0.40	6	8
0.41-0.50	1	4
0.51-0.60	2	3
0.61-0.70	1	1
0.71-0.80	1	0
0.81-0.90	0	0
0.91-1.00	2	0
1.01-1.10	3	0
1.11-1.20	1	0
1.21-1.30	1	0
Totals	23	25

Tables XXIII and XXIV. It will be seen from Table XXIV that the average iron content of the orichalcum coins of the two major periods is the same according to the new analyses, which is what would be expected for iron as a purely accidental component, whereas the average of the results of Bibra for these two periods are very different. Apparently the generally higher results reported by Bibra are due to errors in his method for determining iron. The iron present in orichalcum coins could have come from the copper ore, the zinc ore, the fuel, the utensils used in the manufacture of the alloy, or from any combination of these sources.

TABLE XXII

IRON CONTENT OF ORICHALCUM COINS OF TRAJAN  
ACCORDING TO DIFFERENT ANALYSTS

<i>Analyst</i>	<i>Iron, %</i>
Genth	0.29
Helm	0.20
Helm	0.15
	Av. = 0.21
Bibra	1.00
Bibra	0.39
	Av. = 0.70
Suarez	0.37
Suarez	0.30
Suarez	0.26
Machemer	0.12
	Av. = 0.26

TABLE XXIII

IRON AND NICKEL CONTENT OF ORICHALCUM COINS IN GENERAL

<i>Source of Data</i>	<i>Metal</i>	<i>Maximum %</i>	<i>Minimum %</i>	<i>Average %</i>
Bibra's Analyses	Iron	1.30	0.01	0.57
New Analyses	Iron	0.67	0.12	0.37
Bibra's Analyses	Nickel	0.50	trace	0.22
New Analyses	Nickel	0.06	none	0.03



TABLE XXIV

COMPARISON OF RESULTS OF PREVIOUS ANALYSES WITH RESULTS OF NEW ANALYSES IN RESPECT TO AVERAGE IRON AND NICKEL CONTENT OF ORICHALCUM COINS OF TWO MAJOR PERIODS

<i>Source of Data</i>	<i>Number of Analyses</i>	<i>Period</i>	<i>Iron %</i>	<i>Nickel %</i>
Bibra's Analyses	5	I	0.31	0.17
New Analyses	12	I	0.36	0.02
Bibra's Analyses	16	II	0.64	0.25
New Analyses	11	II	0.36	0.04

As shown in Table XVIII, nickel was found in small and not very different proportions in a large majority of the orichalcum coins that were analyzed, actually in twenty-one out of the twenty-five. Proportions of nickel too small to detect by the method that was used may have been present in the few coins in which none was found. Bibra and Helm (Tables X and XI, respectively) are the only previous analysts who reported the presence of nickel in orichalcum coins. Bibra reported that nickel was present in all the coins he analyzed, though in determinable proportions in only eighteen out of the twenty-three. Helm reported determinable proportions in two out of four. However, the proportions of nickel reported by Bibra and by Helm are much higher than those found by these new analyses. Summarized comparisons of the nickel determinations reported by Bibra and those now reported are shown in Tables XXIII and XXIV. The generally high results for nickel obtained by Bibra are undoubtedly due to his use of an inaccurate method for its determination. The inaccuracy of Bibra's method has been demonstrated by Ibbotson,<sup>85</sup> who, by means of a series of trial analyses, found that this method, though trustworthy from a qualitative standpoint, is liable under certain conditions to yield high quantitative results.

Nickel, like iron, is an accidental impurity in orichalcum, but with the difference that the nickel came from a single principal source, this being the copper ore from which the copper for the alloy was smelted. The association of the nickel with the copper in orichalcum is in-

<sup>85</sup> Desch, C. H., *Report of the British Association for the Advancement of Science* (1928), p. 437.

dictated by the tendency of the proportion of nickel to increase with an increase in the proportion of copper, as is shown in Table XXV for the coins analyzed in this present investigation. No correlation exists between the proportions of nickel and the proportions of any other component of orichalcum. The reason for the higher average proportion of nickel in the coins of Period II (Table XXIV) is therefore the higher average proportion of copper in the coins of this period. This association of nickel with copper has been noticed in other classes of ancient coins.<sup>86</sup> The nickel content of orichalcum coins is very similar to that of most other ancient coins composed of copper alloys that were issued in the Mediterranean region at various places and at various times. Thus for ancient Greek bronze coins in general<sup>87</sup> the average proportion of nickel has been found to be 0.04%, and for the local bronze coins of Athens struck in Roman Imperial times<sup>88</sup> the nickel content has been found to range from 0.02% to 0.06% with an average of 0.04%.

TABLE XXV

## CORRELATION OF COPPER AND NICKEL CONTENT

<i>Range of Copper Content %</i>	<i>Average Nickel Content %</i>	<i>Number of Coins</i>
Under 76.00	0.015	2
76.01 to 80.00	0.018	9
80.01 to 84.00	0.035	6
84.01 to 88.00	0.037	6
Over 88.00	0.040	2

Since cobalt is commonly associated with nickel in ores it might be expected that cobalt would also be present in orichalcum coins, though in lower proportions because of the lesser abundance of this element. Bibra (Table X) reported the presence of traces of cobalt in four of the coins he analyzed. No other previous analyst has reported its presence in orichalcum coins, probably because no tests were made for it. As

<sup>86</sup> Caley, E. R., *Chemical Composition of Parthian Coins*, NNM, No. 129 (New York, 1955), p. 15.

<sup>87</sup> Caley, E. R., *The Composition of Ancient Greek Bronze Coins* (Philadelphia, 1939), p. 154.

<sup>88</sup> Caley, E. R., *op.cit.*, p. 26.

will be seen from the notes to Table XVIII, traces of cobalt were found in five coins out of a total of twelve tested for this element. It is evident, therefore, that cobalt in very small proportions is frequently present as an accidental impurity in orichalcum.

Silver was found in all but five of the coins that were analyzed, but as will be seen from the results in Table XVIII the proportion did not exceed 0.10% in any one of the coins. The average proportion for the twenty coins that contained silver is only 0.05% and for the group as a whole only 0.04%. The proportions reported by Genth and by Helm (Tables IX and XI, respectively) are all higher. On the other hand, Bibra (Table X) reported silver to be present in only two coins, and then only in traces. The new results, which lie between these extremes, are probably nearer the truth.

The silver in orichalcum appears to be largely associated with the copper. This association is indicated by the tendency of the proportion of silver to increase with an increase in the proportion of copper, as is shown in Table XXVI for the coins analyzed in this investigation. No other regular correlation between the proportions of silver and the proportions of any other component is apparent from the data of Table XVIII, though it seems probable that some of the silver in some of the coins was associated with the lead. It seems significant that the four coins in which the proportion of lead is the lowest contain no silver, and that all of the four coins in which the proportion of lead is the highest contain silver, even though no regular correlation exists between the proportions of silver and lead in the coins that contain intermediate proportions of lead. Moreover, the coins of Period I in which the average proportion of lead is 0.23% contain only 0.02% silver on the average, whereas the coins of Period II in which the average proportion of lead is 1.06% contain 0.06% silver on the average. Thus it would appear that silver as an accidental impurity in orichalcum is sometimes associated with the lead as well as with the copper.

As shown in Table XVIII, only one coin of the group that was analyzed was found to contain a weighable proportion of gold, though traces were detected in nine others. The presence of gold in orichalcum has not been reported previously. This accidental impurity is probably associated with the copper, the silver, or both.

TABLE XXVI

CORRELATION OF COPPER AND SILVER CONTENT

<i>Range of Copper Content %</i>	<i>Average Silver Content %</i>	<i>Number of Coins</i>
Under 76.00	0.020	2
76.01-80.00	0.026	9
80.01-84.00	0.043	6
84.01-88.00	0.057	6
Over 88.00	0.050	2

It is clear from Table XVIII that arsenic is a rather frequent minor component or impurity in orichalcum. This is contrary to the findings of previous investigators, none of whom reported the presence of arsenic except Bibra (Table X) and this investigator reported its presence in only three out of twenty-three coins, and then only as traces. Arsenic is a rather frequent impurity in Greek bronze coins,<sup>89</sup> the source apparently being copper ores, and its presence in orichalcum coins is therefore to be expected. From Table XVIII it will be seen that there is a decided tendency for arsenic to be present in higher proportions in late orichalcum coins. In the group of coins of Period I analyzed for this element, the average proportion is only 0.02%, whereas in the group of Period II, the average proportion is 0.09%.

As is evident from Table XVIII and the notes to this table, antimony occurs less frequently than arsenic, and in lower proportions. Antimony was found in only a third of the fifteen coins tested for this element, and the average proportion for this whole group of coins was only about 0.01%. This also is contrary to the findings of Bibra (Table X) who reported proportions of antimony ranging from 0.02% to 1.30% in eight of the coins he analyzed, and traces in nine others, out of a total of twenty-three. However, the method he employed for the detection and determination of antimony is known to be defective.<sup>90</sup> As with arsenic, there is a tendency for the proportion of antimony to be higher in later coins, though the evidence for this is

\* Caley, E. R., *The Composition of Ancient Greek Bronze Coins* (Philadelphia, 1939), p. 161.

\*\* Ibid., p. 162.

perhaps less conclusive than for arsenic. Antimony was absent from six of the coins of Period I tested for this element, and the remaining two contained about 0.01% each, whereas it was absent from only four of Period II, and the remaining three were estimated to contain 0.01%, 0.05% and 0.10%, respectively.

Although only eight of the coins were tested for bismuth, the results of the tests indicated that this element is an infrequent trace impurity in orichalcum. The possible occurrence of bismuth in this alloy apparently has not been investigated before.

Sulfur is frequently present as an impurity in late orichalcum coins, but not in early ones, as may be seen from the data of Table XVIII. Of the ten coins of Period I tested for sulfur, nine were found to contain none, and the remaining one only 0.03%, whereas of the eight coins of Period II, only one was found to contain no sulfur, and in the remaining seven the proportion ranged from 0.08% to 0.32%. Furthermore, the later coins of Period II were found to contain the highest proportions. Bibra (Table X) found traces of sulfur in ten of the coins he analyzed, and 0.10% in each of two others. His results agree with the present results in that the measurable proportions of sulfur occurred in late coins. The likely sources of this impurity are sulfide ores of copper or zinc, or both.

As remarked previously, the defective summations of some of the analyses probably indicate the presence of oxygen in the form of metal oxides in certain of the coins. The microscopic examination of ancient alloys almost always reveals the presence of at least slight amounts of oxidized metal, but there is often uncertainty as to how much of this was present originally and how much was produced later by natural corrosion. However, in view of the crude methods of ancient metallurgy, the very frequent presence of at least traces of oxygen as an original accidental impurity in orichalcum appears very likely.

## VI. ANALYSES OF ROMAN COINS COMPOSED OF OTHER ALLOYS CONTAINING ZINC

Orichalcum may be defined as an alloy of copper and zinc in which the proportion of zinc is high enough to give it a color that is appreciably different from that of copper, and in which the proportion of any other metal, or combination of other metals, is considerably lower than that of the zinc. Of the other metals that may be present in ancient copper alloys containing zinc, only tin and lead are of significance as components that may be present in higher proportion than the zinc. In the early years of the Empire, as is shown by the analyses in the preceding tables, the proportion of zinc usually exceeds twenty per cent, and the proportion of tin and lead, taken together, usually amounts to but a few tenths of one per cent. Later, the proportion of zinc sometimes falls below ten per cent, and the proportion of tin or lead, or both together, often exceeds one per cent. The allowable lower limit for the proportion of zinc is to some extent a matter of arbitrary opinion. A reasonable conclusion would appear to be that an alloy containing less than five per cent of zinc should not be classed as orichalcum. The color of such an alloy of copper and zinc is not very different from that of copper itself, and zinc in such low proportion is more likely to be present as an accidental impurity in the copper than as an addition resulting from intentional manufacture. Furthermore, when the proportion of tin or lead, or both taken together, exceeds the proportion of zinc, the alloy also should not be classed as orichalcum since zinc is then no longer the principal alloying component. The Roman coinage alloys containing zinc that should not be classed under this term may be grouped as follows:

### Class I

Alloys containing less than five per cent of zinc,  
in which the proportion of tin or lead, or both  
together is less than the proportion of zinc;

## Class II

Alloys containing less than five per cent of zinc, in which the proportion of tin or lead, or both together, exceeds the proportion of zinc;

## Class III

Alloys containing five per cent or more of zinc, in which the proportion of tin or lead, or both together, exceeds the proportion of zinc.

When the proportions of zinc, tin and lead in an alloy of Class I amounts to only about one per cent, it may be regarded as being little more than an impure copper. An alloy of Class II may be termed a tin bronze when the proportion of tin is much higher than the proportions of zinc and lead, or a leaded tin bronze when the proportions of tin and lead are much higher than the proportion of zinc. An alloy of Class III may be termed a zinc bronze. Alloys of all three classes, with wide variations in the relative proportions of zinc, tin and lead, are well represented in the later Roman *aes* coinage.

On the basis of all the available analytical evidence, orichalcum is the only alloy that was used for the coinage of sestertii and dupondii in Period I, i.e., during the reigns from Tiberius to Nerva inclusive. This same evidence shows that it was almost exclusively used for this purpose in the first half of Period II, i.e., during the reigns from Trajan to Antoninus Pius inclusive. It is in the second half of this period that coins of these denominations were often struck in alloys other than orichalcum.

In Table XXVII are listed analyses by previous investigators of sestertii and dupondii of Period II composed of alloys which are not orichalcum in the proper meaning of this term. It will be seen that the metal of two of these coins (Nos. 1 and 4) belongs in Class I, the metal of five of them (Nos. 2, 5, 6, 7 and 8) in Class II, and the metal of the remaining one (No. 3) in Class III.

Orichalcum was rarely used for sestertii and dupondii in the third century. Analyses by previous investigators of coins of these denominations issued in the first half of this century are listed in Table

TABLE XXVII

PREVIOUS ANALYSES OF SESTERTII AND DUPONDII OF PERIOD II NOT  
COMPOSED OF TRUE ORICHALCUM

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Nickel %	Other %	Total %
1	94.63	3.18	0.50	0.53	0.72	0.44	trace	100.00
2	83.39	0.85	6.20	6.79	—	—	—	97.23
3	79.24	6.29	4.99	9.20	0.23	—	—	99.95
4	92.57	4.01	1.80	0.25	1.24	0.10	0.03	100.00
5	82.81	4.86	3.97	8.36	—	—	—	100.00
6	88.88	3.82	4.20	2.60	0.50	trace	trace	100.00
7	89.41	0.94	5.42	4.23	trace	trace	none	100.00
8	87.23	4.50	3.55	4.40	0.21	0.11	none	100.00

*Identifications and Notes*

1. Sestertius of Trajan. Wt. = 24.7 grams.  
Said to contain traces of antimony and arsenic.  
Analyzed by Bibra, *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 54–55, No. 38.
2. Sestertius of Marcus Aurelius.  
Analysis published by Mattingly, *BMC Coins of the Roman Empire, Vol. IV* (London, 1940), p. xvi.
3. Sestertius of Faustina, Jr. Wt. = 23.5 grams.  
Analyzed by Phillips, *Journal of the Chemical Society*, IV (1852), pp. 281–282.
4. Dupondius of Marcus Aurelius. Wt. = 9.2 grams.  
Said to contain 0.03% antimony and traces of cobalt and arsenic.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 58.
5. Dupondius of Marcus Aurelius.  
Analysis published by Mattingly, op.cit., p. xvii.  
The zinc content was merely estimated as being over 4%.  
The figure in the table was obtained by difference.
6. Sestertius of Lucius Verus. Wt. = 23.7 grams.  
Said to contain a trace of antimony.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 60.
7. Sestertius of Commodus. Wt. = 24.9 grams.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 64.
8. Dupondius of Crispina. Wt. = 11.4 grams.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 65.

XXVIII. The metal of only one of these coins (No. 2) may be classed as orichalcum, and even in this one the proportion of tin is much



higher than in orichalcum coins of the previous two centuries which contain a like proportion of zinc. The reported complete absence of zinc in No. 10 may well be questioned, for at least some zinc has been found in all other *aes* coins of the third century that have so far been analyzed. However, it might be that little more than a trace was present. Evidently the metal of No. 10 is merely impure copper containing various impurities in the total proportion usually found in Roman copper. The same is true of No. 11. The metal of four of these coins (Nos. 6, 7, 8 and 9) belongs in Class II and the metal of seven (Nos. 1, 3, 4, 5, 12, 13 and 14) in Class III.

TABLE XXVIII

## ANALYSES OF THIRD CENTURY SESTERTII AND DUPONDII

Coin No.	Copper %	Zinc %	Tin %	Lead %	Iron %	Nickel %	Other %	Total %
1	86.98	5.00	4.27	3.23	trace	0.41	0.11	100.00
2	76.62	17.08	4.00	0.95	0.68		0.21	99.54
3	71.56	8.79	6.45	13.09	—	—	—	99.89
4	70.83	6.90	5.97	16.29	—	—	—	99.99
5	75.00	5.63	6.82	12.00	—	—	0.05	99.50
6	84.00	3.35	6.33	6.00	0.30	0.02	none	100.00
7	84.49	3.15	5.98	6.15	0.13	0.10	trace	100.00
8	72.01	4.60	15.28	7.12	—	—	—	99.01
9	77.10	1.36	7.54	12.70	—	—	—	98.70
10	98.22	none	1.03	0.33	trace	0.30	0.12	100.00
11	97.52	0.67	0.53	0.48	0.40	0.40	trace	100.00
12	78.00	8.33	8.73	4.74	trace	trace	0.20	100.00
13	81.18	8.00	7.53	3.04	0.10	0.08	0.07	100.00
14	76.20	5.84	5.14	12.02	—	—	—	99.20

*Identifications and Notes*

1. Dupondius of Caracalla. Wt. = 10.1 grams.  
Said to contain 0.11% antimony and traces of cobalt and sulfur.
2. Analyzed by Bibra, *op.cit.*, pp. 54–55, No. 66.  
Sestertius of Julia Soaemias. Wt. = 23.6 grams.  
Only the sum of the iron and nickel is reported.  
Said to contain 0.21% silver.  
Analyzed by Hofmann, *Numismatische Zeitschrift*, XVI (1884), p. 10.
3. Sestertius of Severus Alexander.  
Analysis reported by Sabatier, *Production de l'or, de l'argent et du cuivre*

*chez les anciens et hôtels monétaires des romains et byzantins* (Petersbourg, 1850), p. 77, No. 10.

4. Sestertius of Severus Alexander. Wt. = 16.4 grams.  
Analyzed by Schardinger and reported by Hofmann, op.cit., p. 11.
5. Sestertius of Severus Alexander. Wt. = 18.8 grams.  
Contains 0.05% of silver.  
Analyzed by Hofmann, op.cit., p. 11.
6. Dupondius of Severus Alexander. Wt. = 11.0 grams.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 67.
7. Dupondius of Severus Alexander. Wt. = 11.5 grams.  
Contains a trace of silver.  
Analyzed by Helm, *Zeitschrift für Ethnologie*, XXVII (1895), p. 20.
8. Dupondius of Julia Mamaea.  
Analysis reported by Sabatier, op.cit., p. 77, No. 12.
9. Sestertius of Gordian III.  
Analysis reported by Sabatier, op.cit., p. 77, No. 13.
10. Sestertius of Gordian III. Wt. = 17.2 grams.  
Said to contain 0.12% of antimony, and traces of arsenic and sulfur.  
Analyzed by Bibra, op.cit., pp. 56–57, No. 69.
11. Sestertius of Gordian III. Wt. = 16.2 grams.  
Said to contain a trace of cobalt.  
Analyzed by Bibra, op.cit., pp. 54–55, No. 68.
12. Sestertius of Gordian III. Wt. = 20.2 grams.  
Said to contain 0.20% of antimony.  
Analyzed by Bibra, op.cit., pp. 56–57, No. 70.
13. Dupondius of Gordian III. Wt. = 10.3 grams.  
Said to contain 0.07% of antimony.  
Analyzed by Bibra, op.cit., pp. 56–57, No. 71.
14. Sestertius of Philip I.  
Analysis reported by Sabatier, op.cit., p. 77, No. 14.

Four new analyses of late sestertii are listed in Table XXIX. It will be seen that the metal of three of these coins belongs in Class II, and that of the remaining one in Class III.

TABLE XXIX

NEW ANALYSES OF LATE SESTERTII NOT COMPOSED OF TRUE ORICHALCUM

<i>Coin</i> No.	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %	<i>Iron</i> %	<i>Nickel</i> %	<i>Other</i> %	<i>Total</i> %
1	80.45	3.99	4.96	9.62	0.51	0.07	0.14	99.74
2	84.97	4.42	7.56	2.67	0.28	0.04	0.09	100.03
3	79.10	0.83	6.42	13.37	0.03	0.16	0.06	99.97
4	67.67	7.58	6.61	16.96	1.08	0.03	0.11	100.04

*Identifications and Notes*

1. Emperor = Marcus Aurelius Date = A.D. 171-172  
 Wt. = 23.6 grams Size = 27-30 mm. Condition = Fine  
*Obv.*: Head of Marcus Aurelius, laureate, r.  
 M ANTONINVS AVG TRP XXVI  
*Rev.*: Roma seated l., on cuirass, holding sceptre;  
 her l. elbow resting on a round shield;  
 behind her an oval shield.  
 IMP VI COS III In field, S C  
*Ref.* BMC, Vol. IV, p. 622, No. 1420.  
 RIC, No. 1037.  
 Analyst: W. H. Deebel  
 The minor components included 0.10% of silver, 0.04% of cobalt, and  
 a trace of gold. Though the coin was fine externally, the metal was to  
 some extent corroded internally, which accounts for the low summation.
2. Emperor = Marcus Aurelius Date = A.D. 177-178  
 Wt. = 21.6 grams Size = 28-30 mm. Condition = Fair  
*Obv.*: Head of Marcus Aurelius, laureate, r.  
 M AVREL ANTONINVS AVG TRP XXXII  
*Rev.*: Felicitas standing l., holding caduceus and sceptre.  
 FELICITAS AVG IMP VIII COS III PP  
 In field, S C  
*Ref.* BMC, Vol. IV, p. 674, No. 1676, pl. 89, No. 2.  
 Analyst: W. H. Deebel  
 The minor components included 0.09% of silver and traces of cobalt  
 and gold.
3. Emperor = Commodus Date = A.D. 189  
 Wt. = 20.7 grams Size = 27-30 mm. Condition = Fair  
*Obv.*: Head of Commodus, laureate, r.  
 M COMMOD ANT P FELIX AVG BRIT PP  
*Rev.*: Minerva standing l., holding Victory and spear;  
 shield l., trophy r.  
 MINER VICT PM TRP XIII IMP VIII COS V DES VI  
 In field, S C  
*Ref.* BMC, Vol. IV, p. 823, No. 637.  
 RIC, No. 546.  
 Analyst: W. H. Deebel  
 The minor components included 0.06% of silver and traces of cobalt  
 and gold.
4. Emperor = Septimus Severus Date = A.D. 208  
 Wt. = 21.4 grams Size = 32 mm. Condition = Poor  
*Obv.*: Bust of Septimus Severus, laureate r.  
 Legend mostly illegible

*Rev.*: Emperor riding on horseback to l.

Legend mostly illegible

*Ref.* BMC, Vol. V, p. 349.

Analysts: P. J. Elving and S. R. Ginsburg

The minor components included 0.10% of arsenic and 0.01% of sulfur.

Analyses of a few miscellaneous Roman coins containing zinc are listed in Table XXX. The first two are late asses. Early asses were almost always struck in nearly pure copper, but some exceptions are known, in particular during the reign of Nero when the as and even its fractions were struck in orichalcum for a brief period.<sup>91</sup> The metal of No. 1 belongs in Class I and that of No. 2 in Class II. No. 3 is of unusual composition for an Alexandrian bronze coin. Other analyses show that such coins were usually composed of a leaded tin bronze.<sup>92</sup> However, only a few coins of this class have been analyzed, and it is entirely possible that many such coins were issued in alloys that contained appreciable proportions of zinc. The metal of No. 4 may be classed as orichalcum, though the proportion of tin is unusually high for an alloy containing so much zinc. Its composition is not only unusual for a coin of so late a date, but even more unusual for a coin struck in a distant province. Analyses of late colonial and local coins of the Empire indicate that they were ordinarily struck in leaded tin bronze.<sup>93</sup> However, here again, not many analyses have been made, and it is entirely possible that some classes of these coins, at least at certain periods, were issued in alloys that contained zinc as a principal component.

TABLE XXX

ANALYSES OF VARIOUS ROMAN COINS CONTAINING ZINC

<i>Coin</i> No.	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %	<i>Iron</i> %	<i>Nickel</i> %	<i>Other</i> %	<i>Total</i> %
1	90.11	4.97	4.34	0.27	0.18	0.02	0.29	100.18
2	84.56	2.89	3.78	8.77	—	—	—	100.00
3	85.48	6.33	5.73	1.53	0.21	0.72	trace	100.00
4	79.27	16.33	2.71	0.73	0.43	0.53	none	100.00

<sup>91</sup> *BMC Coins of the Roman Empire*, Vol. I (London, 1923), pp. 248–259.

<sup>92</sup> Caley, E. R., *ANS Centennial Publication* (New York, 1958), p. 176.

<sup>93</sup> Caley, E. R., *The Composition of Ancient Greek Bronze Coins* (Philadelphia, 1939), pp. 26, 45, 92.

*Identifications and Notes*

1. As of Faustina, Jr. Date = A.D. 161–176  
Wt. = 10.3 grams Size = 25 mm. Condition = Poor  
*Obv.*: Bust of Faustina, Jr., to r.  
Legend mostly illegible.  
*Rev.*: Female figure standing with head to l.  
Legend mostly illegible.  
*Ref.* *BMC*, Vol. IV, pp. 538–543.  
Analysts: P. J. Elving and S. R. Ginsburg  
The minor components included 0.06% arsenic and 0.23% sulfur.
2. As of Commodus. Analysis reported by Mattingly, loc.cit.
3. Alexandrian coin of Hadrian. Wt. = 8.0 grams.  
Analyzed by Bibra, op.cit., pp. 84–85, No. 67.
4. Colonial coin of Elagabalus struck in Nicea in Bithynia. Analyzed by  
Bibra, op.cit., pp. 84–85, No. 68.

## VII. COMPOSITION OF THE ORICHALCUM AND ZINC BRONZE SESTERTII AND DUPONDII OF INDIVIDUAL EMPERORS

Sufficient data are now available from the results of previous analyses and new analyses to show the important variations in the composition of the orichalcum and zinc bronze sestertii and dupondii issued during the reigns of most of the principal emperors from the beginning of the Empire to about the middle of the third century. In order to show the significant variation in composition within the reign of any given emperor, and the variation from emperor to emperor, only the proportions of copper, zinc, tin and lead need be considered since the proportions of the other elements in the alloys do not vary in any systematic way. The proportions of these four principal metals in the coins of the individual emperors are shown in Tables XXXI to XLIX inclusive. In those tables which contain information on more than one coin, the analytical data are arranged in the order of the decreasing percentages of zinc in the coins. In the averages of all the analyses in each of these tables, the average proportions of tin and lead are given only if these elements were reliably determined in all the coins. The averages of what are termed "good analyses" in certain of the tables are based on the individual analyses which appear to be reliable from the standpoint of both the identification of the coins and the quality of the analyses.

The composition of the eight sestertii and dupondii of Augustus that have been analyzed is shown in Table XXXI. It would appear that such coins vary greatly in the proportions of copper and zinc they contain. However, the range of composition is much smaller if only the coins identified with certainty are considered. Nos. 1, 2, 3, 4 and 6 were coins of the III VIR type struck at an Italian mint or mints, and No. 5 was of the CA type struck at some eastern mint, but the types of Nos. 7 and 8 analyzed by Bibra (Table X, Nos. 1 and 2) are unknown since no descriptions accompanied his analyses. That they were of either the III VIR type or the CA type seems unlikely in view of

their low zinc content. They may have been coins of certain of the many less common types struck under Augustus, or they may have been restored coins of Augustus struck at a much later date. The fact that their tin content is higher than that found in any other orichalcum coins struck prior to the middle of the first century A.D. would appear to be an indication of a later date. There is even a possibility that they were incorrectly identified and that they were not coins of Augustus at all. However this may be, it is clear from what is now known about the composition of the sestertii and dupondii struck prior to the middle of the first century A.D. that the composition of coins of the III VIR type set a pattern or standard for the composition of the orichalcum used for the coins of these two denominations for over half a century after the first issue of coins of this type. Although the data on the tin and lead content of the orichalcum coins of Augustus are insufficient to allow any exact conclusion as to the ranges and average proportions of these metals, it seems certain that both were present merely as accidental impurities. Since only five III VIR type coins and only a single CA type coin have been analyzed up to now, more analyses of coins of these important types, and analyses of coins of certain other types as well, are needed before any definitive conclusions can be reached about the composition of the orichalcum coins of Augustus.

TABLE XXXI

## COMPOSITION OF SESTERTII AND DUPONDII OF AUGUSTUS

No.	Denomination	Copper %	Zinc %	Tin %	Lead %
1	Dupondius	76.4	23.6	—	—
2	Sestertius	76.7	23.3	—	—
3	Sestertius*	76.70	22.02	0.27	0.37
4	Dupondius*	77.36	21.88	0.17	0.16
5	Dupondius	78.7	20.6	—	0.7
6	Sestertius	82.38	17.36	—	—
7	Sestertius	87.05	11.80	0.72	trace
8	Sestertius	92.57	5.15	1.05	trace
Av. of all analyses		81.0	18.2	—	—
Av. of new analyses*		77.03	21.95	0.22	0.27
Av. of III VIR type coins		77.9	21.6	—	—

Unfortunately, only a single analysis, that listed in Table XXXII, of an orichalcum coin of Tiberius is available. However, since the composition of this coin agrees well with the composition of the orichalcum coins of both his predecessor and his successor, it is not unlikely that its composition is typical of the composition of the sestertii and dupondii of this emperor.

TABLE XXXII

COMPOSITION OF A DUPONDIIUS OF TIBERIUS

<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
%	%	%	%
76.86	22.85	0.03	0.04

The composition of the six sestertii and dupondii of Caligula that have been analyzed is shown in Table XXXIII. The zinc content of No. 1 is the highest that has been found in any Imperial orichalcum coin that has been carefully analyzed. However, the average proportions of copper and zinc in the coins of Caligula are very close to the average proportions of these metals in the III VIR type coins of Augustus. The proportions of tin and lead in these coins of Caligula are remarkably low, and with the exception of the single coin of Tiberius listed in Table XXXII, are in fact lower than the proportions of these metals in the orichalcum coins of any other emperor.

TABLE XXXIII

COMPOSITION OF SESTERTII AND DUPONDII OF CALIGULA

No.	<i>Denomination</i>	<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
		%	%	%	%
1	Dupondius*	72.63	26.71	0.02	0.16
2	Sestertius*	77.52	22.20	0.04	0.01
3	Sestertius*	78.19	21.11	0.12	0.04
4	Dupondius	79.3	20.7	—	—
5	Dupondius	80.3	19.7	—	—
6	Sestertius*	81.03	18.55	none	0.05
Av. of all analyses		78.2	21.5	—	—
Av. of new analyses*		77.34	22.14	0.05	0.07



In Table XXXIV is shown the composition of the eight sestertii and dupondii of Claudius that have been analyzed. The zinc content of No. 1 is the highest that has been reported for any orichalcum coin of the Imperial period, but this result must be regarded with some doubt because the method used by the analyst could not have yielded a very accurate result. The closeness of the average proportions of copper and zinc to those in the coins of Caligula is remarkable. The proportions of tin and lead are definitely higher and more erratic.

TABLE XXXIV

## COMPOSITION OF SESTERTII AND DUPONDII OF CLAUDIUS

<i>No.</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	Dupondius	72.20	27.7	—	—
2	Sestertius*	75.91	23.20	0.09	0.12
3	Sestertius	77.9	22.1	—	—
4	Sestertius	77.44	21.50	0.30	trace
5	Sestertius	76.85	21.33	—	0.20
6	Dupondius*	77.59	21.11	0.10	0.83
7	Dupondius	81.4	18.6	—	—
8	Dupondius	81.1	15.7	—	—
Av. of all analyses		77.5	21.4	—	—
Av. of new analyses*		76.75	22.15	0.10	0.48

The composition of a sestertius and three dupondii of Nero is shown in Table XXXV. It will be seen that the average proportion of zinc is lower than in the coins of the preceding emperors. Though a final

TABLE XXXV

## COMPOSITION OF A SESTERTIUS AND DUPONDII OF NERO

<i>No.</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	Dupondius*	77.27	22.46	none	0.15
2	Dupondius*	78.24	20.98	none	0.14
3	Sestertius	81.07	17.82	1.05	—
4	Dupondius*	83.16	15.95	0.01	0.12
Av. of all analyses		79.94	19.30	—	—
Av. of new analyses*		79.56	19.80	trace	0.14

conclusion cannot be safely based on only four analyses, it would appear that the decline in the zinc content of the orichalcum used for coinage began with the reign of Nero. The similarity of composition of Nos. 1 and 2 is remarkable because these coins, though of somewhat similar type, were struck at different mints. No. 1 was struck at Rome, and No. 2 at Lugdunum. This similarity is perhaps significant as indicating the use of the same minting procedures at different mints in the Empire at this period.

In Table XXXVI is shown the composition of a sestertius and a dupondius of Vespasian. No averages are given because there are only two analyses, and one of them is not very exact. However, it is evident that the zinc content of the coins is generally lower than that of the coins of Nero, and the proportions of tin and lead generally higher. If the decline in the quality of orichalcum did not begin with the reign of Nero it certainly did with the reign of Vespasian.

TABLE XXXVI

COMPOSITION OF A SESTERTIUS AND A DUPONDIUS OF VESPASIAN

No.	Denomination	Copper %	Zinc %	Tin %	Lead %
1	Sestertius	81.4	16.4	0.8	1.1
2	Dupondius	85.89	13.02	0.40	0.31

The composition of dupondii of Titus and Domitian is shown in Table XXXVII. Their zinc content is definitely lower than that of the two coins of Vespasian, though this difference is perhaps not significant in view of the small number of analyses on which to base this conclusion. With the exception of one coin of Augustus of somewhat uncertain identity, the zinc content of No. 2 is the lowest that has been found in any orichalcum coin issued prior to the second century A.D.

TABLE XXXVII

COMPOSITION OF DUPONDII OF TITUS AND DOMITIAN

No.	Emperor	Copper %	Zinc %	Tin %	Lead %
1	Titus	83.13	15.90	—	—
2	Domitian	88.19	10.23	0.51	0.30

The composition of three dupondii of Nerva is shown in Table XXXVIII. They are very similar in composition, which is not surprising in view of the fact that they must all have been issued within a period of about two years. Their average zinc content is only slightly less than the average zinc content of the four coins of Vespasian, Titus and Domitian listed in the two preceding tables. The proportions of tin and lead in the orichalcum coins issued during the reigns of Vespasian to Nerva inclusive are generally higher than in the coins of preceding emperors.

TABLE XXXVIII

## COMPOSITION OF DUPONDII OF NERVA

<i>No.</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	83.60	14.82	0.70	0.54
2*	84.69	13.59	0.57	0.49
3*	86.30	12.94	0.52	trace
Av. of all analyses	84.86	13.78	0.60	0.34
Av. of new analyses*	85.50	13.27	0.55	0.25

As is shown in Table XXXIX, a considerable amount of information is available on the composition of the sestertii and dupondii of Trajan. In these coins as a whole the proportions of copper and zinc vary over a wide range. However, if Nos. 13, 14, 15 and 16 are excluded, the range of variation of the proportions of copper and zinc in the remainder, constituting seventy-five per cent of the coins, is not very great. The composition of the coins of this large fraction may perhaps be regarded as typical for the reign of this emperor. The zinc content of No. 16 is so low that the alloy is better classified as impure copper rather than orichalcum. This coin is clearly atypical in composition. In most of the individual coins, and on the average, the proportions of tin and lead are much higher than in the coins of any preceding emperor. The proportions of both tin and lead in No. 10 are unusually high for a coin of this period, and for this reason this coin is also atypical in composition.

TABLE XXXIX

COMPOSITION OF SESTERTII AND DUPONDII OF TRAJAN

No.	Denomination	Copper %	Zinc %	Tin %	Lead %
1	Dupondius*	81.21	17.76	0.02	0.37
2	Dupondius	78.08	16.68	2.14	0.57
3	Sestertius	79.5	16.6	trace	1.3
4	Dupondius	82.2	16.5	0.5	0.8
5	Dupondius	83.4	16.4	—	trace
6	Sestertius	80.6	16.4	3.0	—
7	Dupondius*	83.48	16.01	0.02	0.10
8	Sestertius	80.09	15.45	2.28	1.63
9	Sestertius	82.13	15.35	1.12	trace
10	Dupondius*	76.83	14.45	4.34	4.33
11	Sestertius*	82.08	14.10	2.05	1.29
12	Sestertius	85.3	13.9	0.8	—
13	Dupondius	83.95	12.42	2.22	0.30
14	Sestertius	87.12	9.90	2.13	0.48
15.	?	88.58	7.56	1.80	2.28
16	Sestertius	94.63	3.18	0.50	0.53
Av. of all analyses		83.0	13.9	—	—
Av. of new analyses*		80.90	15.58	1.61	1.52
Av. of good analyses		83.46	12.99	1.69	1.08

A considerable amount of information is also available on the composition of the sestertii and dupondii of Hadrian, as is shown in Table XL. In these coins also, the proportions of copper and zinc vary over a wide range, but on the average the zinc content is decidedly lower than in the coins of Trajan. The average proportions of tin and lead are also lower. There appears to be no basis for classifying any of these coins as being abnormal or atypical in composition.

The composition of ten sestertii and dupondii of Antoninus Pius is shown in Table XLI. It will be seen that the ranges in the proportions of copper and zinc are smaller than in the coins of Hadrian, and that the proportions of zinc are lower at both ends of the scale. However, the average proportion of zinc is only a little less than in the coins of Hadrian. The proportions of tin and lead are also similar.

TABLE XL

## COMPOSITION OF SESTERTII AND DUPONDII OF HADRIAN

<i>No.</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	Sestertius	82.35	16.84	0.43	trace
2	Dupondius	82.91	15.57	0.60	0.06
3	Sestertius	84.8	14.8	trace	trace
4	Sestertius	85.14	13.98	0.68	0.12
5	Dupondius	85.7	13.6	—	—
6	Sestertius	86.5	13.5	—	—
7	Sestertius	86.1	13.4	0.2	—
8	Dupondius	83.7	12.7	2.8	0.8
9	?	86.92	10.97	0.72	1.10
10	Sestertius	85.77	10.89	1.15	1.74
11	Dupondius	88.50	9.05	1.27	0.30
12	Sestertius	91.24	7.14	0.32	0.44
13	Sestertius	90.49	7.04	1.10	0.20
14	Sestertius	89.92	6.74	1.52	0.37
Av. of all analyses		87.4	11.9	—	—
Av. of good analyses		87.03	10.91	0.87	0.48

TABLE XLI

## COMPOSITION OF SESTERTII AND DUPONDII OF ANTONINUS PIUS

<i>No.</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	Sestertius	86.39	13.1	—	trace
2	Dupondius*	86.28	12.71	0.06	0.32
3	Sestertius	86.85	12.6	—	trace
4	Sestertius*	86.79	12.33	none	0.13
5	Sestertius	87.88	11.28	none	0.09
6	Dupondius*	86.51	11.14	1.69	0.11
7	Dupondius*	89.29	9.38	0.16	0.35
8	Sestertius	87.86	8.14	3.88	trace
9	Dupondius	92.79	6.7	trace	trace
10	Sestertius	91.72	5.33	1.55	trace
Av. of all analyses		88.2	10.3	—	—
Av. of new analyses*		87.22	11.39	0.48	0.23
Av. of good analyses		88.05	10.04	1.05	0.14

The composition of sixteen sestertii and dupondii of Marcus Aurelius and Lucius Verus is shown in Table XLII. It is evident that

these coins as a group are radically different in composition from those of Antoninus Pius and from those of all the preceding emperors as well. Their average zinc content is much lower, and the average proportions of tin and lead much higher. Only half the coins are composed of orichalcum, the remainder being composed of zinc bronze, except for No. 16 in which the alloy is a leaded tin bronze.

TABLE XLII

COMPOSITION OF SESTERTII AND DUPONDII  
OF MARCUS AURELIUS AND LUCIUS VERUS

No.	Denomination	Copper %	Zinc %	Tin %	Lead %
1	Sestertius	88.71	10.8	trace	trace
2	Dupondius	88.59	10.4	trace	0.48
3	Sestertius	81.47	10.30	6.62	0.02
4	Sestertius*	87.86	9.06	2.03	0.23
5	Dupondius*	88.96	7.87	2.33	0.18
6	Sestertius	87.73	7.5	1.58	2.71
7	Sestertius	87.31	7.08	4.02	0.83
8	Sestertius	89.13	7.0	3.33	trace
9	Sestertius	79.24	6.29	4.99	9.20
10	Sestertius	85.63	6.07	4.62	2.00
11	Dupondius	87.47	5.4	5.06	1.56
12	Dupondius	82.81	4.5	3.97	8.36
13	Sestertius*	84.97	4.42	7.56	2.67
14	Sestertius*	80.45	3.99	4.96	9.62
15	Sestertius	88.88	3.82	4.20	2.60
16	Sestertius	83.39	0.85	6.20	6.79
Av. of all analyses		85.79	6.6	3.84	2.95
Av. of new analyses*		85.56	6.34	4.22	2.01
Av. of good analyses		84.82	5.98	4.75	3.41

As is shown in Table XLIII, the average zinc content of eight sestertii and dupondii of Commodus is even less than that of the coins of Marcus Aurelius and Lucius Verus. Their tin content is about the same, but their average lead content is higher, though this is partly due to the very high lead content of No. 8. In this group also, only half the coins are composed of orichalcum. The other half is equally divided between coins composed of zinc bronze and coins composed of leaded tin bronze.

TABLE XLIII

COMPOSITION OF SESTERTII AND DUPONDII OF COMMODUS

<i>No.</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %
1	Dupondius	78.24	10.2	3.12	7.98
2	Sestertius	87.70	7.92	2.90	0.42
3	Sestertius	87.07	7.1	1.94	3.37
4	Dupondius	86.85	6.43	1.64	4.28
5	Sestertius	82.69	5.8	2.93	8.12
6	Sestertius	85.60	5.77	4.02	4.17
7	Sestertius	89.41	0.94	5.42	4.23
8	Sestertius	79.10	0.83	6.42	13.37
Av. of all analyses		84.58	5.6	3.55	5.74
Av. of good analyses		85.73	4.38	4.08	5.29

Unfortunately, very few analyses are available of sestertii and dupondii issued by the emperors between Commodus and Severus Alexander. The composition of a sestertius of Septimus Severus is shown in Table XLIV. The alloy of this coin may be classed as a zinc bronze containing a very high proportion of lead. It is, in fact, the highest proportion of lead ever found in any sestertius or dupondius. Shown in Table XLV is the composition of a dupondius of Caracalla. The alloy of this coin is also a zinc bronze, but one containing a low proportion of lead. The composition of a sestertius of Julia Soaemias is shown in Table XLVI. This is of special interest because it is apparently the latest Roman coin of regular Imperial issue composed of an alloy that may be classed as orichalcum. The colonial coin of Elagabalus of similar composition listed as No. 4 of Table XXX must be contemporaneous or nearly so. The fact that these two coins of the same regime are composed of orichalcum containing a moderately high proportion of zinc suggests that this type of orichalcum may have been commonly used for a brief period at this late date. However, no valid generalization about the composition of the sestertii or dupondii issued between the reigns of Commodus and Severus Alexander can be based on these isolated examples, except possibly to conclude that they vary greatly in composition.

TABLE XLIV

COMPOSITION OF A SESTERTIUS OF SEPTIMUS SEVERUS

<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
%	%	%	%
67.67	7.58	6.61	16.96

TABLE XLV

COMPOSITION OF A DUPONDIUS OF CARACALLA

<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
%	%	%	%
86.98	5.00	4.27	3.23

TABLE XLVI

COMPOSITION OF A SESTERTIUS OF JULIA SOAEMIAS

<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
%	%	%	%
76.62	17.08	4.00	0.95

Shown in Table XLVII is the composition of six sestertii and dupondii of Severus Alexander. The alloys of all these coins may be classed as zinc bronzes, but the first three contain high proportions of lead and the other three much lower proportions. No. 4 is remarkable as containing the highest proportion of tin ever found in a sestertius or dupondius.

TABLE XLVII

COMPOSITION OF SESTERTII AND DUPONDII OF SEVERUS ALEXANDER

No.	<i>Denomination</i>	<i>Copper</i>	<i>Zinc</i>	<i>Tin</i>	<i>Lead</i>
		%	%	%	%
1	Sestertius	71.56	8.79	6.45	13.09
2	Sestertius	70.83	6.90	5.97	16.29
3	Sestertius	75.00	5.63	6.82	12.00
4	Dupondius	72.01	4.60	15.28	7.12
5	Dupondius ?	84.00	3.35	6.33	6.00
6	Dupondius ?	84.49	3.15	5.98	6.15
Av. of all analyses		76.32	5.40	7.81	10.11



The composition of four sestertii and a dupondius of Gordianus III is shown in Table XLVIII. It will be seen that these coins vary more in composition than those of Severus Alexander. Nos. 1 and 2 are composed of zinc bronze, and No. 3 of leaded tin bronze, but the metal of the last two is only impure copper.

TABLE XLVIII

COMPOSITION OF SESTERTII AND A DUPONDIUS OF GORDIANUS III

No.	Denomination	Copper %	Zinc %	Tin %	Lead %
1	Sestertius	78.00	8.33	8.73	4.74
2	Dupondius	81.18	8.00	7.53	3.04
3	Sestertius	77.10	1.36	7.54	12.70
4	Sestertius	97.52	0.67	0.53	0.48
5	Sestertius	98.22	none	1.03	0.33
Av. of all analyses		86.40	3.67	5.07	4.26

A sestertius of Philip I is the latest Roman coin of any denomination in which zinc has been found to be an essential component of the alloy. As is shown in Table XLIX, the alloy is a zinc bronze containing a high proportion of lead, and is very similar in composition to the alloy of a sestertius of Severus Alexander listed as No. 3 of Table XLVII.

TABLE XLIX

COMPOSITION OF A SESTERTIUS OF PHILIP I

Copper %	Zinc %	Tin %	Lead %
76.20	5.84	5.14	12.02

In all the preceding discussion, the sestertii and dupondii have been considered together on the assumption that the coins of each of these denominations issued under the same emperor were very similar in composition. The extent to which this is true is indicated by the data in Table L, in which are listed the average proportions of copper and zinc in the sestertii and dupondii of those emperors for which a sufficient number of examples of the coins of each denomination have been analyzed to make such a comparison possible. Though the data

appear to show that the average copper content of the sestertii is more often a little higher and the average zinc content a little lower than in the dupondii, the difference is rather slight on the whole, for the average of all the averages for the copper content of the sestertii is 82.6%, and that for the dupondii is 82.1%. Also, the average of all the averages for the zinc content of the sestertii is 15.0%, and that for the dupondii is 15.9%. Even such small differences might become still smaller if larger numbers of sestertii and dupondii were analyzed and compared in composition. There appears to be no reasonable doubt that the intention was to strike Imperial sestertii and dupondii in orichalcum of the same composition in each of the individual reigns over the long period when this alloy was used exclusively as the material for the coins of these denominations.

TABLE L

SIMILARITY OF AVERAGE PROPORTIONS OF COPPER AND ZINC  
IN SESTERTII AND DUPONDII

<i>Emperor</i>	<i>Denomination</i>	<i>Copper</i> %	<i>Zinc</i> %
Augustus	Sestertius*	78.6	20.9
	Dupondius*	76.9	22.8
Caligula	Sestertius	78.9	20.6
	Dupondius	77.4	22.5
Claudius	Sestertius	77.0	22.0
	Dupondius	78.1	20.8
Trajan	Sestertius	83.9	13.1
	Dupondius	81.3	15.8
Hadrian	Sestertius	86.9	11.6
	Dupondius	85.2	12.7
Antoninus Pius	Sestertius	87.9	10.5
	Dupondius	88.7	10.0
Marcus Aurelius and Lucius Verus	Sestertius	85.4	6.4
	Dupondius	87.0	7.0

\*IIIVIR type

Two salient facts emerge from this survey of the composition of sestertii and dupondii. One is the almost constant average zinc con-

tent of the coins for something over half a century after the first III VIR type coins of Augustus were issued. The other is the systematic decrease in the zinc content after this initial period. The data show that the average proportion of zinc begins to decrease with the reign of Nero, and then continues to decrease at various rates. This change is rapid until the time of Nerva, is more gradual during the reigns of Trajan, Hadrian and Antoninus Pius, and then again undergoes a sharp decrease in the joint reign of Marcus Aurelius and Lucius Verus, followed by a smaller decrease in the reign of Commodus. For those reigns from Augustus to Commodus, inclusive, for which sufficient data are available, the most reliable figures for the average zinc content are listed in Table LI. The figures for Period I are based on the new analyses, and those for Period II on the "good" analyses. As is also shown in Table LI, the systematic changes in zinc content are accompanied by corresponding changes in the average proportions of tin and lead in the coins. These averages are on the same basis as the averages for zinc. Though the changes in the average proportion of tin or lead, or both taken together, are much less regular than the changes in the average proportions of zinc, certain general trends are obvious. In Period I the proportions of tin, lead, or both, are generally lower than in Period II. Within Period I, there are two reigns, those of Caligula and Nero, in which the proportions of these metals in the alloy are very low. At the end of this period, in the reign of Nerva, the coins have a higher average tin content, and a higher total content of tin and lead than in any previous reign. In the reign of Trajan the average proportions of these metals increase markedly. Though the tin content is lower in the two succeeding reigns, it is higher than in any reign of Period I, as is also the total content of tin and lead. With the joint reign of Marcus Aurelius and Lucius Verus there is a sudden relatively large increase in the proportions of both tin and lead, followed by a marked increase in the proportion of lead in the reign of Commodus. At the end of Period II, both the average lead content and the total tin and lead content exceed the average proportion of zinc in the coins. Possible reasons for these more or less systematic chronological changes in the zinc, tin and lead content of the sestertii and dupondii are discussed in the next section.

TABLE LI

AVERAGE ZINC, TIN, AND LEAD CONTENT OF SESTERTII AND DUPONDII

<i>Period</i>	<i>Emperor</i>	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %	<i>Tin+Lead</i> %
I	Augustus	21.95	0.22	0.27	0.49
	Caligula	22.14	0.05	0.07	0.12
	Claudius	22.15	0.10	0.48	0.58
	Nero	19.80	trace	0.14	0.14
	Nerva	13.27	0.55	0.25	0.80
II	Trajan	12.99	1.69	1.08	2.77
	Hadrian	10.91	0.87	0.48	1.35
	Antoninus Pius	10.04	1.05	0.14	1.19
	Marcus Aurelius and Lucius Verus	5.98	4.75	3.41	8.16
	Commodus	4.38	4.08	5.29	9.37

## VIII. MANUFACTURE OF ORICHALCUM

All the available evidence indicates that the manufacture of orichalcum in Roman times began about 45 B.C., and that its sole use in the very late Republican period was for coinage. No orichalcum objects other than coins datable to this period have been found, and literary evidence for any other use is lacking. Grant<sup>94</sup> is of the opinion that its manufacture during this period was a monopoly of the state for exclusive use in coinage. A few miscellaneous orichalcum objects appear to date from as early as the first half century of the Imperial period and a small number of objects other than coins have been found that are of later date, but there are various indications that coins served as the source of the metal for most, if not all, of these miscellaneous objects. The possibility exists, therefore, that the Roman state continued to exercise a monopoly on the manufacture of orichalcum, for it is not easy to account otherwise for its exclusive, or almost exclusive, use for coinage.

No details of the process used for the manufacture of orichalcum by the Romans have come down to us. As with most other ancient technical processes, those who knew the details left no records and those who wrote about such processes had no first-hand information. Moreover, the writers of the time may not have been able to obtain much information about this particular process because it was a monopoly of the state and an integral part of government minting practice. However, it is possible for us to gain some insight into this manufacturing process from some remarks made by Pliny and by Dioscorides, from the results of analyses of orichalcum coins, and from certain chemical and metallurgical considerations.

Pliny,<sup>95</sup> in the course of his discussion of the relative merits of different kinds of copper, makes the following pertinent remark:

Velocis defectus Livianum quoque, certe admodum exiguum invenitur. summa gloriae nunc in Marianum conversa, quod et Cordubense dicitur. hoc a Liviano cadmeam maxime sorbet et aurichalei bonitatem imitatur in sestertiis dupondiarisque, Cyprio suo assibus contentis.

<sup>94</sup> Grant, M., *From Imperium to Auctoritas* (Cambridge, 1946), p. 88.

<sup>95</sup> *Natural History*, Book XXXIV, sec. 4.

(Livian copper also gave out quickly, for very little is now found. The highest reputation has now gone to the Marian kind, also called the Cordovan. Next to the Livian, this kind most readily absorbs *cadmea* and reproduces the excellence of aurichalcum in making sestertii and dupondii. The as must still be content with its own Cyprian copper). The word *cadmea* has been only transliterated since there is no exact English equivalent. From the descriptions of Pliny<sup>96</sup> and of Dioscorides,<sup>97</sup> the Latin *cadmea* and the corresponding Greek καδμεία were, in the first century A.D., names that denoted two distinct groups of related substances. The first group included certain zinc minerals, probably only calamine and smithsonite, and the ores composed chiefly of one mineral or the other. Some statements of Pliny would appear to indicate that one kind of copper ore was also included, but this would seem to be one of his not uncommon errors. The second group included artificial products obtained as sublimates in the flues and on the walls of smelting furnaces, but these were sometimes prepared by roasting one of the substances in the first group separately in a special furnace. These artificial products appear always to have been kinds of zinc oxide that differed only in physical form and in degree of purity. Some of them were given special names based on their superficial appearance. Natural *cadmea* appears to have been the kind used to treat copper in order to convert it into orichalcum, but there is a possibility that the artificial products were sometimes used.

The statement of Pliny quoted above leaves no doubt that orichalcum was produced for Roman coins by a cementation process. In this type of process for the manufacture of brass as carried out in medieval and early modern time,<sup>98</sup> bars, plates, or irregular pieces of copper were buried in a mixture of zinc ore and charcoal in a crucible, and on heating the charge to a sufficiently high temperature the zinc ore was reduced by the charcoal and the liberated metal in the form of a vapor was then absorbed by the copper. The degree of penetration of the copper by the zinc and the total proportion of zinc absorbed was dependent on the surface area of the copper, the thickness of the copper, the temperature, and the length of time of treatment, but it

<sup>96</sup> Op.cit., Book XXXIV, secs. 100–103.

<sup>97</sup> *Materia Medica*, Book V, Chapters 84–85.

<sup>98</sup> Forbes, R. J., *Metallurgy in Antiquity* (Leiden, 1950), p. 277.

<sup>99</sup>

was not possible by this treatment alone to produce a uniform alloy. In order to produce such an alloy the temperature was raised to the fusion point and the molten metal was thoroughly stirred. A remark by Dioscorides<sup>99</sup> indicates that the Roman process was different. He states that in the final treatment of copper the founders threw on it large portions of finely ground καδμεία in order to improve the quality of the metal. Since treatment with zinc ore or zinc oxide alone would have had no effect, some reducing agent such as charcoal must also have been present. Possibly the actual procedure was to stir both charcoal and καδμεία into the molten copper in the form of a mixture of the two. Another possibility is that only a zinc mineral or a zinc ore was added, and that this was stirred into the molten copper with wooden poles which supplied the necessary reducing agents. Although a copper-zinc alloy was undoubtedly produced by one procedure or the other, a considerable proportion of the zinc ore or zinc oxide must have been lost by volatilization. An indication of this is the mention by Dioscorides of the very fine white smoke (i.e., zinc oxide) that was evolved during the treatment of the copper. The quantity of this was in fact so great that it was worth while to collect it from the flues and walls of the melting furnace. Not only was this process for the manufacture of orichalcum wasteful of the zinc mineral or ore, but the proportion of zinc in the finished alloy must have been difficult to control. However, neither the metalworkers nor anyone else at that time had the idea that zinc was alloyed with copper in the process, and that the color and other properties varied with the proportion of zinc. The statements of both Pliny and Dioscorides show that they had no understanding of the chemical changes involved in the treatment of copper with compounds containing zinc. Pliny apparently believed that the metal absorbed the *cadmea*, as is evident from the preceding quotation, and Dioscorides believed that it merely improved the quality of the copper.

That the Roman process did not always produce a homogeneous alloy is obvious from physical examination of the metal of sestertii and dupondii. Sometimes the degree of heterogeneity is so great that it is evident from visual inspection of the coins themselves, but in a larger proportion, only when sections of metal cut from coins are

<sup>99</sup> *Materia Medica*, Book V, Chapter 85.

examined with a microscope by the technique of metallography. One occurrence of a very marked degree of heterogeneity was encountered in the course of the present investigation. A sestertius of Caligula, while being sampled for analysis, was observed to contain an enclosed irregular lump of metal that was reddish in color in sharp contrast with the bright yellow color of the bulk of the metal. This lump was isolated and analyzed. Its composition as compared with that of the bulk of the metal is shown in Table LII. The low summation of the analysis is due to the presence of cuprous oxide, which, in addition to the low zinc content, fully accounts for the observed reddish color.

TABLE LII

COMPOSITION OF REDDISH METAL INCLUSION IN COIN OF CALIGULA COMPARED WITH THE COMPOSITION OF THE REMAINDER OF THE COIN

<i>Metal</i>	<i>Inclusion</i> %	<i>Remainder</i> %
Copper	92.14	77.52
Zinc	6.65	22.20
Tin	0.06	0.04
Lead	0.02	0.01
Iron	0.24	0.27
Nickel	0.03	0.03
Total	99.14	100.07

Analyst: M. C. Suarez

A rather close estimate of the purity of the copper used in the manufacture of orichalcum may be obtained from the data of the new analyses of this investigation. As previously explained, the impurities found on analysis were largely, if not entirely, associated with the copper. If the assumption is made that all these impurities were associated with the copper and none with the zinc, it is possible to calculate the purity of the copper used in the manufacturing process simply by prorating the percentages of copper and total impurities over a scale of one hundred percent. The results of such calculations for the coins of Period I are shown in Table LIII. Since the contemporaneous as was struck from ordinary unalloyed copper, in all probability of the same quality as that used for making orichalcum, a comparison of the results in this table with figures for the purity of



the copper of the as should be a means of checking the validity of the above assumption. Unfortunately, only a few careful quantitative analyses have been made of examples of the Roman as. Some of the early analysts of coins of this denomination reported that they were composed of completely pure copper, and this erroneous information is frequently found in works on Roman numismatics. The only determinations of the actual purity of the metal sufficiently accurate for the present comparison are listed in Table LIV, and even some of these were obtained by making certain corrections in the published analytical data, as is stated in the notes to this table. In correcting the

TABLE LIV

CALCULATED PURITY OF THE COPPER USED FOR THE MANUFACTURE OF ORICHALCUM FOR SESTERTII AND DUPONDII DURING PERIOD I

<i>Coin</i> <i>No.</i>	<i>Emperor</i>	<i>Copper</i> %	<i>Total</i> <i>Impurities</i> %
1	Augustus	99.05	0.95
2	Augustus	98.45	1.55
	Av. =	98.75	1.25
3	Tiberius	99.53	0.47
4	Caligula	99.05	0.95
5	Caligula	99.52	0.48
6	Caligula	99.30	0.70
7	Caligula	99.63	0.37
	Av. =	99.38	0.62
8	Claudius	98.76	1.24
9	Claudius	98.14	1.86
	Av. =	98.45	1.55
10	Nero	99.25	0.75
11	Nero	99.43	0.57
12	Nero	99.45	0.55
	Av. =	99.38	0.62
13	Nerva	97.94	2.06
14	Nerva	98.25	1.75
	Av. =	98.10	1.90

percentages of nickel, the correction most frequently made, the percentages reported by Bibra were reduced to 0.04%, the proportion normally present in Greek and Roman monetary copper whenever this element is present as an impurity. The two most reliable results are for Nos. 2 and 3 for which no corrections were needed. On comparing the data in Table LIII with those in Table LIV, it will be seen that the correlation is rather close for the emperors common to both tables. It seems very probable, therefore, that the calculated purity of the copper in the earlier sestertii and dupondii of Period I, at least, is that of the copper actually used in the manufacturing process. This indicates that the raw material containing zinc that was used in the manufacture of the orichalcum was of a high degree of purity. In other words, it was not crude zinc ore containing a high proportion of metal impurities, but was at least selected zinc ore, and it may have been a pure zinc mineral or even pure zinc oxide manufactured by sublimation. A similar calculation of purity of the copper used for the manufacture of coins of Period II, especially the later coins, is not feasible for reasons that will appear in the discussion that follows.

TABLE LIV

PURITY OF COPPER IN THE ROMAN AS OF PERIOD I

<i>Coin No.</i>	<i>Emperor</i>	<i>Copper %</i>	<i>Total Impurities %</i>
1	Augustus	98.73	1.27
2	Tiberius	99.65	0.35
3	Caligula	99.24	0.76
4	Caligula	99.11	0.89
5	Nero	99.10	0.90
6	Vespasian	99.74	0.26
7	Domitian	99.33	0.67

Notes

Nos. 1 and 2 were analyzed by P. J. Elving and S. R. Ginsburg and were published in Caley, E. R., *The Composition of Ancient Greek Bronze Coins* (Philadelphia, 1939), p. 107. The analysis of No. 1 has been corrected for the low summation due to the presence of oxygen. The remainder were analyzed by E. von Bibra and were published in his *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 52-53.

The analyses of Nos. 4 to 7 inclusive have been corrected for the high nickel results obtained by the method used by Bibra, and the analyses of Nos. 5 and 6 for the supposed antimony content reported by Bibra.

The rather wide variations in the percentages of zinc in the coins of even the earlier emperors (Tables XXXI, XXXIII and XXXIV) are easily understandable in view of the difficulty of controlling the zinc content closely in the process used for the manufacture of the alloy. Nevertheless, the average ratio of the proportion of zinc to the proportion of copper is remarkably constant for the coins of the emperors from Augustus to Claudius inclusive, as is shown in Table LV. In this table the data for Period I are based on the new analyses, except for the coins of Vespasian, no specimens of which were analyzed in the present investigation, and the data for Period II are based on the "good" analyses. The figures in the third column of the table show the true zinc to copper ratios, and those in the fourth column the ratios of the proportion of zinc to the proportion of copper plus its principal associated impurities, in other words the ratio of zinc to copper of the average quality actually used in the manufacture of the

TABLE LV

AVERAGE RATIO OF ZINC CONTENT TO COPPER CONTENT AND OF  
ZINC CONTENT TO COPPER, TIN AND LEAD CONTENT  
IN SESTERTII AND DUPONDII

<i>Period</i>	<i>Emperor</i>	<i>Zn</i>	<i>Zn</i>
		<i>Cu</i>	<i>Cu+Sn+Pb</i>
I	Augustus	0.285	0.283
	Caligula	0.286	0.286
	Claudius	0.289	0.286
	Nero	0.249	0.248
	Vespasian	0.176	0.175
	Nerva	0.155	0.154
II	Trajan	0.156	0.151
	Hadrian	0.125	0.123
	Antoninus Pius	0.114	0.113
	Marcus Aurelius and Lucius Verus	0.071	0.064
	Commodus	0.051	0.046

alloy. However, the differences between the ratios in the two columns for the coins from Augustus to Claudius inclusive are very slight. This virtual constancy of the average ratios up to the time of Nero indicates the use of the same manufacturing process during this time, and one so standardized in procedure that the average zinc content of the alloy remained essentially the same in spite of unavoidable variations in the zinc content from batch to batch. The figures also show that scrap copper alloys were not used in the manufacture during this time since such scrap would have consisted largely of tin bronze or leaded tin bronze, and higher proportions of tin and lead would have been found on analysis. It necessarily follows that worn coins from earlier periods were not added. All the facts indicate that the alloy during the reigns of Augustus to Claudius, inclusive, was always newly manufactured by a single standardized procedure without the use of any secondary metal.

What now needs to be explained is the progressive fall in the average zinc content of orichalcum coins in Period I after the reign of Claudius. One possible cause is that zinc minerals and ores were becoming increasingly scarce and costly due to the exhaustion of certain deposits, and that this led to the use of less zinc compound in the manufacture of orichalcum. But this is not the only possible cause. Another, and perhaps more likely one, is that worn coins from earlier reigns were now being remelted for the manufacture of metal for new coins. If worn sestertii, dupondii and asses were melted together for this purpose the resulting alloy would, of course, have a lower zinc content. Even if only worn sestertii and dupondii were remelted the resulting alloy would have a lower zinc content than the worn coins. On melting brass there is a preferential loss of zinc due to volatilization and oxidation. This is a well known phenomenon that has received considerable study. The average loss of zinc that commonly occurs in melting and pouring common yellow brass in modern American foundry practice is about six per cent of that originally present.<sup>100</sup> The further losses on subsequent treatment, such as annealing, amount to about four per cent, for a total of about ten per cent. With alloys of lower zinc content, similar to orichalcum, the percentage loss is less

<sup>100</sup> Bassett, W. H., *Journal of Industrial and Engineering Chemistry*, IV (1912), pp. 164-165.

with the same time and temperature of exposure.<sup>101</sup> However, with the smaller scale operations and cruder methods of the ancient founders the loss with alloys of lower zinc content may well have equalled or exceeded that encountered in modern practice with alloys of higher zinc content. On the assumption that the loss would have been about ten per cent on remelting worn orichalcum coins, it is interesting to calculate what effect this would have had on the ratio of zinc to copper if coins of emperors prior to Nero were remelted to furnish metal for new coins. If the ratio of zinc to copper in the worn coins was about 0.285, a loss of ten per cent would reduce this ratio to about 0.257, and if the loss in weight were compensated by the addition of copper, the ratio would become about 0.250. From Table LV it will be seen that both figures are rather close to the average ratio for the coins of Nero. Hence it is entirely possible that much of the orichalcum for the coins of Nero and subsequent emperors in the latter part of Period I was obtained by remelting worn coins from previous reigns.

In view of the great volume of the orichalcum coinage of Trajan, Hadrian and Antoninus Pius, it may be doubted that this practice was sufficient to supply metal for all the orichalcum coins issued in the first part of Period II. Probably some new orichalcum was made during the reigns of these emperors, and this supply of new metal supplemented the supply of secondary metal obtained by remelting worn coins. That considerable secondary metal was used is indicated by the marked increase in the average tin and lead content of the coins of Trajan, which is evident from the ratios listed in Table LVI. This increase shows that some bronze was being added at some point in the manufacturing process, most likely in the remelting of coins. Possibly worn Roman colonial bronze coins were now being included in small proportion among those remelted. The wide range in the zinc content of the sestertii and dupondii of Trajan (Table XXXIX) indicates the use of both new and secondary metal for orichalcum coinage during his reign. The same seems true for the coins of Hadrian and to a lesser extent for those of Antoninus Pius. After the reign of Antoninus Pius the sudden decrease in the average zinc content

<sup>101</sup> Johnston, J., *Journal of the American Institute of Metals*, XII (1918), pp. 15-26.

TABLE LVI

AVERAGE RATIO OF TIN CONTENT TO COPPER CONTENT, OF LEAD CONTENT TO COPPER CONTENT, AND OF SUM OF TIN AND LEAD CONTENT TO COPPER CONTENT IN SESTERTII AND DUPONDII

<i>Period</i>	<i>Emperor</i>	$\frac{Sn}{Cu}$	$\frac{Pb}{Cu}$	$\frac{Sn+Pb}{Cu}$
I	Augustus	0.0029	0.0035	0.0064
	Caligula	0.0006	0.0009	0.0015
	Claudius	0.0013	0.0063	0.0076
	Nero	0.0000	0.0018	0.0018
	Nerva	0.0064	0.0029	0.0093
II	Trajan	0.0202	0.0129	0.0331
	Hadrian	0.0100	0.0055	0.0155
	Antoninus Pius	0.0119	0.0016	0.0135
	Marcus Aurelius and Lucius Verus	0.0560	0.0402	0.0962
	Commodus	0.0511	0.0617	0.1128

(Table LV) and the even greater proportional increase in the tin and lead content (Table LVI) indicates that the source of the metal for sestertii and dupondii was worn coins, probably supplemented by miscellaneous copper and bronze scrap metal. In other words, orichalcum itself was no longer being manufactured. Possibly the manufacture of this alloy tapered off during the first part of Period II because of the approaching exhaustion of the available zinc deposits.

The increasing addition of poor quality metal to the coinage alloy in the latter part of Period II is indicated by the progressive increase in the total proportions of arsenic and sulfur, as is shown by Table LVII which lists the percentages of arsenic and sulfur in all the coins from Tiberius to Commodus inclusive in which both these elements were determined. Especially significant is the general absence of sulfur from coins of Period I and the general progressive increase in the proportion of this element in coins of Period II. This appears to mean that the copper entering into the alloy of the earlier coins was made from oxidized or surface ores, and that an increasing proportion of the copper that entered into the alloy of later coins was produced from the deeper sulfide ores. It also appears to indicate a growing scarcity of copper, for the oxidized ores were much easier to work. Recourse to

the sulfide ores would only have come after the supply of oxidized ores had been practically exhausted. This may be still another cause for the extensive reworking of metal for the production of the minor coinage after the time of Antoninus Pius.

TABLE LVII

HIGHER PROPORTIONS OF ARSENIC AND SULFUR IN  
ORICHALCUM COINS OF LATER DATE

<i>Example No.</i>	<i>Date A.D.</i>	<i>Arsenic %</i>	<i>Sulfur %</i>	<i>Total %</i>
1	22-23	none	none	none
2	37-38	0.02	none	0.02
3	39-40	none	none	none
4	39-40	none	none	none
5	41	0.04	none	0.04
6	41	0.02	none	0.02
7	64-66	0.05	none	0.05
8	96-98	0.02	none	0.02
9	112-114	none	none	none
10	116-117	0.03	0.08	0.11
11	141+	0.06	0.12	0.18
12	154-155	0.10	0.17	0.27
13	154-155	0.12	0.21	0.33
14	161-162	0.21	0.17	0.38
15	162-163	0.08	0.28	0.36
16	179	0.13	0.32	0.45

Although our information about the composition of the sestertii and dupondii issued by the successors of Commodus is fragmentary (Tables XLIV to XLIX inclusive), it clearly indicates a still greater use of miscellaneous secondary metal. Especially significant are the high proportions of lead in many of the coins (Table XLIV; Table XLVII, Nos. 1, 2, 3; Table XLVIII, No. 3; Table XLIX). Since bronze of high lead content was commonly used for the late local coins of the empire, and for other purposes as well in the same general period, the high proportions of lead in these late sestertii and dupondii may have been the result of including worn local coins, as well as miscellaneous high lead bronze, in the metal remelted for coinage. The great variation in the composition of late sestertii and dupondii is a

strong indication of the use of miscellaneous metal of varied composition for the production of the coinage alloy.

Economic factors may have also contributed to the progressive decrease in the zinc content of orichalcum coins after the reign of Claudius. Because of the additional raw material and the additional smelting operations required, orichalcum, from the beginning, must have been always a more costly coinage alloy than unalloyed copper. Perhaps the double value of the dupondius in relation to the as of the same weight represents the approximate initial ratio of the cost of orichalcum to that of copper. As nearby zinc ore deposits were exhausted and more distant sources had to be utilized, this ratio would become higher, unless the proportion of zinc ore or mineral used in the manufacture of the alloy was decreased with the resulting production of orichalcum of lower zinc content. This would account for the composition of certain orichalcum coins of low zinc content issued in the first part of Period II (e.g., Nos. 4 and 5 of Table XLI), for these coins also have a very low tin and lead content which indicates that they were made from newly manufactured orichalcum rather than from secondary metal of any kind.

The extensive use of secondary metal for sestertii and dupondii in the latter part of Period II and especially in the first half of the third century may have been caused in large part by the growing debasement of the silver coinage. Though it seems generally agreed that sestertii and dupondii were token coins, they had, because of their much greater weight, a much larger intrinsic metal value compared to the precious metals than most modern token coins made of base alloys. As the Roman silver coinage became more debased the intrinsic metal value of the sestertii and dupondii approached closer and closer to their nominal value. Under these circumstances there was a strong inducement to strike them from cheap secondary or scrap metal rather than from a more costly newly manufactured alloy.



## IX. VARIOUS ORICHALCUM OBJECTS AND SOME MODERN FORGERIES

In addition to the orichalcum coins which have been analyzed, about fifty other metal objects excavated at various sites both within and beyond the boundaries of the Roman Empire have been found on analysis to be composed of alloys more or less similar to those of the coins in composition. Many of these objects are of uncertain period, some are very probably of medieval origin, and some can be dated with various degrees of certainty to the general period of the Roman Empire. Göbel<sup>102</sup> was the first to analyze a number of objects of this general class. The objects he analyzed were found in the course of excavations and explorations in 1839, at various sites in the Russian Baltic provinces of that time. Archaeological evidence indicated that these sites dated from the ninth to the eleventh centuries A.D. However, on the basis of his analyses, Göbel advanced the theory that the objects themselves were of Roman origin. He suggested the following alternate possibilities:

1. The objects were made by the Romans and reached the Baltic provinces by trade.
2. The objects were made in these provinces by Roman metalworkers or by local artisans instructed by them.
3. The objects reached these provinces as military loot, after first being brought into Germany or Scandinavia by trade, or after being made locally in those regions by Roman metalworkers or by local artisans instructed by them.

On comparing the composition of these objects with that of some orichalcum coins, Göbel concluded that the alloys were very similar. However, he had for this comparison only a few imperfect analyses of such coins. In fact the alloys are not closely similar in composition, for

<sup>102</sup> Göbel, F., *Ueber den Einfluß der Chemie auf die Ermittlung der Völker der Vorzeit oder Resultate der chemischen Untersuchung metallischen Alterthümer insbesondere der in den Ostseegouvernements vorkommenden, Behufs der Ermittlung der Völker, von welchen sie abstammen* (Erlangen, 1842), pp. 18–22, 32–34.

some very significant differences exist. This may be illustrated by his analyses of parts of two balances, which he particularly considered to be Roman, not only on the basis of the composition of the metal but also on the basis of their form and the weight system used for one of them. The results of his analyses are shown in Table LVIII. Though the range of the proportions of zinc fall well within the range for orichalcum, the proportions of tin in three of the objects and the proportion of lead in the other one are much too high for orichalcum containing such proportions of zinc. As is apparent from Tables XXXI to XXXV inclusive, orichalcum that contains twenty per cent or more of zinc contains very little tin. Even the object in which only a trace of tin was present contained much more lead than is found in orichalcum coins of similar zinc content, as may be seen from Tables XXXVI to XL inclusive. The composition of these objects therefore differs from that of orichalcum, at least the kind of orichalcum used for coinage, and, as previously remarked, it is very probable that the Romans manufactured the alloy only for this purpose. Hence the theory of Göbel appears to have no sound basis, and a post-Roman date for the objects found in the Baltic provinces seems very probable.

TABLE LVIII

ANALYSES BY GÖBEL OF BALANCE PARTS AND WEIGHTS  
OF SUPPOSED ROMAN ORIGIN

<i>Balance No.</i>	<i>Part</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Total %</i>
I	Beam	76.50	20.30	2.45	trace	99.25
	Pan	76.45	20.03	3.51	trace	99.99
II	Pan	79.45	16.95	2.25	1.31	99.96
	Weight	80.95	13.86	trace	5.25	100.06

Still other differences, such as the proportions of certain impurities such as iron, may serve to distinguish orichalcum from copper-zinc alloys made in medieval times. This may be illustrated by the analyses, published by Wocel,<sup>103</sup> of two small objects found in Bohemia and believed to date from near the end of the first millenium A.D. The

<sup>103</sup> Wocel, J. E., *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Wien, Philosophisch-Historische Classe*, XI (1853), pp. 723, 728.

results of these analyses are shown in Table LIX. Object No. 1 not only contained much higher proportions of tin and lead than is present in orichalcum containing over twenty per cent of zinc, but also contained a much higher proportion of iron than orichalcum of any zinc content, as may be seen from the proportions of iron listed in Tables X and XVIII. Object No. 2 contained higher proportions of tin and lead than is normally present in orichalcum containing nearly ten per cent of zinc, and an even higher proportion of iron than No. 1. By reason of such differences, medieval objects composed of copper-zinc alloys may usually be distinguished from Roman objects of similar zinc content by chemical analysis.

TABLE LIX

ANALYSES OF TWO OBJECTS KNOWN TO BE POST-ROMAN

<i>Object</i> <i>No.</i>	<i>Copper</i> %	<i>Zinc</i> %	<i>Tin</i> %	<i>Lead</i> %	<i>Iron</i> %	<i>Total</i> %
1	68.69	20.89	3.80	4.02	2.31	99.71
2	79.85	9.95	2.65	4.20	3.53	100.18

Listed in Table LX are the available analyses of those orichalcum objects other than coins that can be ascribed to the Roman Imperial period on the basis of both archaeological evidence and chemical composition. Nos. 1, 9 and 10 were analyzed by Fellenberg,<sup>104</sup> Nos. 2 and 3 by Gowland,<sup>105</sup> Nos. 5 and 6 by Church<sup>106</sup> and the remainder by Bibra.<sup>107</sup> For some of the objects, i.e., Nos. 2, 3, 5, 6 and 10, the archaeological evidence for a Roman date is stronger than for the others. No. 10 is particularly interesting in this respect. This object had the form of a thin curved rectangular plate about six inches long and half as wide, and was provided with holes at the four corners, which, together with its inscription, indicated that it was a name plate. It was found near Basel-Augst, Switzerland, by a farmer, who

<sup>104</sup> Fellenberg, L. R. von, *Mitteilungen der Naturforschenden Gesellschaft in Bern* (1860), pp. 74-75; *Ibid.* (1861), p. 179; *Ibid.* (1863), p. 139.

<sup>105</sup> Gowland, W., *Journal of the Institute of Metals*, VII (1912), p. 44.

<sup>106</sup> Church, A. H., *Journal of the Chemical Society*, XVIII (1865), pp. 215-217.

<sup>107</sup> Bibra, E. von, *Die Bronzen und Kupferlegierungen der alten und ältesten Völker* (Erlangen, 1869), pp. 70-71.

nailed it to his wagon as an ornament. Because of the apparent antiquity of the object and the curious inscription on it, the farmer brought it to the attention of a local manufacturer, who acquired it. A short account of this object and the circumstances of its discovery was published afterwards by Professor Roth.<sup>108</sup>

In spite of the layers of green corrosion products and some hammer marks, the inscription on the convex side was easily legible and complete. It consisted of three lines of capital letters as follows:

DEO INVICTO  
TYPVM AVROCHALCVM  
SOLIS.

This may be translated as follows: (To the invincible God an orichalcum figure of Sol). There can be little doubt that the deity referred to is Mithras. It seems not unlikely that the figure was made of the same alloy as its name plate. This plate is the largest orichalcum object so far analyzed, and of course the statue or statuette was much larger.

TABLE LX

## ANALYSES OF VARIOUS OBJECTS OF ROMAN ORIGIN

Object	Copper	Zinc	Tin	Lead	Other Components	Total
No.	%	%	%	%	%	%
1	75.07	24.45	0.20	none	0.28	100.00
2	80.42	18.77	none	0.09	0.62	99.90
3	82.31	17.11	none	0.08	0.45	99.95
4	82.01	15.30	1.79	0.80	0.10	100.00
5	84.27	14.70	2.36	—	—	101.33
6	84.90	13.00	1.03	1.07	—	100.00
7	84.45	12.31	1.72	1.44	0.08	100.00
8	86.95	11.03	1.35	0.31	0.36	100.00
9	87.07	10.87	0.91	0.75	0.40	100.00
10	85.96	10.61	2.40	—	1.03	100.00
11	85.94	9.31	1.50	2.03	1.22	100.00
12	87.28	8.22	2.00	1.70	0.80	100.00

<sup>108</sup> Roth, K. L., *Anzeiger für schweizerische Geschichte und Alterthumskunde* (March, 1860), p. 85.

*Descriptions and Notes*

1. Roman fibula from Mainz, Germany. The only other component reported was iron, 0.28%.
2. Rosette from a Roman casket found at Silchester, England. The other components reported were: iron, 0.62%; silver, a trace; cobalt and nickel, none.
3. Stud from a Roman casket found at Silchester, England. The other components were: iron, 0.45%; silver, a trace; cobalt and nickel, none.
4. Bracelet from unknown site. The other components were: iron, a trace; nickel, 0.10%; silver, antimony and sulfur, traces.
5. Needle found at Southwark, England. The result for zinc is stated to include a small amount of iron. No other components were reported.
6. Another needle from the same site as No. 5. The result for zinc is also a little high because of the presence of iron. No other components were reported.
7. Fibula from an excavation on the Rhine. The other components were: iron, 0.08%; nickel, a trace.
8. Another fibula from the same source as No. 7. The other components were: iron, 0.21%; nickel, 0.15%; sulfur, a trace.
9. Earring from a grave at Castanietissa on the island of Euboea. The only other component reported was iron, 0.40%.
10. Inscribed metal plate found near Basel-Augst, Switzerland. The only other component reported was iron, 1.03%.
11. Fibula from an excavation on the Rhine. The other components were: iron, 1.02%; nickel, 0.10%; silver, a trace; antimony, 0.10%; arsenic, a trace.
12. Fibula from the same source as No. 11. The other components were: iron, 0.50%; nickel, 0.30%; cobalt, a trace.

In view of the apparent monopoly that the Roman state held on the manufacture of orichalcum, it follows that orichalcum coins were probably the immediate source of the metal for these miscellaneous objects. From Table LX it will be seen that the proportions of the main components of the alloys vary in the same way as in orichalcum coins, for the objects of highest zinc content (Nos. 1, 2 and 3) contain very little tin and lead, those of intermediate zinc content contain appreciable proportions of tin and lead, and those of lowest zinc content (Nos. 11 and 12) contain the highest total proportions of tin and lead. By comparing the figures of Table LX with those of Tables XXXI to XLI inclusive it will be seen that the composition of most of these objects is close to that of certain orichalcum coins of similar zinc content. These similarities tend to support the theory that

orichalcum coins were the source of the metal for these objects. Though no weights are given, most of them apparently weighed less than a sestertius and could have been made from single coins. If objects of this sort were fashioned from coins by simple cold working, their composition should be identical with that of the coins from which they were made, but if their production involved the remelting of coins, some differences in composition might be expected because of probable loss of zinc through volatilization and oxidation.

Though no dates have been assigned to any of the objects listed in Table LX, it should be possible, because of the chronological changes in the composition of orichalcum, to make some rough estimates of their dates. For the same reason it should be possible to estimate from the results of analyses the dates of orichalcum coins that are illegible because of wear or corrosion. This might be especially useful for coins of this sort found in excavations when the dates of the strata in which they are found or the dates of associated objects need to be determined. Since the dates of such coins can be estimated more closely than the dates of the objects, this problem will be considered first.

Although the average zinc, tin, and lead content of the coins issued in the successive reigns undoubtedly vary in a systematic way chronologically, as is shown in Table LI, these averages cannot be used to date individual illegible coins because of the considerable range in the proportions of these metals in the coins issued in any given reign. The only feasible way to estimate the date of a single coin would seem to be to establish a series of composition patterns, or categories of composition, each of which will extend over several reigns and then to compare the composition of the given coin with this series until a match is obtained. In Table LXI is shown a series of categories of composition for orichalcum and zinc bronze sestertii and dupondii derived from the analyses listed in Tables XXXI to XLIX inclusive, together with the corresponding date ranges. Not covered by these categories and ranges are the very few coins of uncertain date or distinctly atypical composition. As would be expected, many of these date ranges overlap each other. They also differ much in length so that the possibility of dating a given coin closely is very dependent on its composition. For example, if it falls into Category I, a fairly close estimate is possible, but not if its composition falls into Category VII.

••

One possible way by which some of these date ranges could be narrowed would be to include also the total proportion of arsenic and sulfur as an index of date of manufacture. As is shown in Table LVII, significant total proportions of these elements appear to occur only in the orichalcum coins of Period II. Furthermore, their total proportion appears to increase chronologically throughout this period. If a coin falling into Category XV with its wide date range from A.D. 98 to A.D. 192 were also analyzed for arsenic and sulfur, the results should narrow this range considerably, for the presence of little or no arsenic and sulfur would indicate a date near the beginning of this range, the

TABLE LXI

APPROXIMATE DATING OF ILLEGIBLE ORICHALCUM AND ZINC BRONZE  
SESTERTII AND DUPONDII FROM THEIR CHEMICAL COMPOSITION

<i>Category</i>	<i>Zinc Content</i>	<i>Total Tin and Lead Content</i>	<i>Possible Date Range</i>
	<i>%</i>	<i>%</i>	
I	25.0 and over	Under 0.5	37 A.D. to 54 A.D.
II	24.9 to 22.5	Under 0.5	23 B.C. to 54 A.D.
III	22.4 to 20.0	Under 0.5	23 B.C. to 68 A.D.
IV	22.4 to 20.0	Over 0.5	23 B.C. to 54 A.D.
V	19.9 to 17.5	Under 1.0	37 A.D. to 117 A.D.
VI	19.9 to 17.5	Over 1.0	54 A.D. to 68 A.D.
VII	17.4 to 15.0	Under 1.0	23 B.C. to 138 A.D.
VIII	17.4 to 15.0	Over 1.0	69 A.D. to 117 A.D.
IX	14.9 to 12.5	Under 1.0	69 A.D. to 161 A.D.
X	14.9 to 12.5	Over 1.0	96 A.D. to 138 A.D.
XI	12.4 to 10.0	Under 0.5	138 A.D. to 180 A.D.
XII	12.4 to 10.0	0.5 to 5.0	81 A.D. to 161 A.D.
XIII	12.4 to 10.0	Over 5.0	161 A.D. to 192 A.D.
XIV	9.9 to 7.5	Under 1.0	138 A.D. to 161 A.D.
XV	9.9 to 7.5	1.0 to 5.0	98 A.D. to 192 A.D.
XVI	9.9 to 7.5	Over 5.0	192 A.D. to 244 A.D.
XVII	7.4 to 5.0	Under 1.0	117 A.D. to 161 A.D.
XVIII	7.4 to 5.0	1.0 to 5.0	117 A.D. to 192 A.D.
XIX	7.4 to 5.0	5.1 to 10.0	161 A.D. to 217 A.D.
XX	7.4 to 5.0	10.1 to 15.0	161 A.D. to 192 A.D.
XXI	7.4 to 5.0	Over 15.0	192 A.D. to 249 A.D.
XXII	Under 5.0	Under 10.0	161 A.D. to 192 A.D.
XXIII	Under 5.0	Over 10.0	161 A.D. to 244 A.D.

presence of about 0.2%, a date near the middle, and the presence of about 0.4%, a date near the end. However, it is doubtful that enough coins have as yet been analyzed for arsenic and sulfur to warrant including this additional index as a factor in a group of formal categories, especially since nothing is known about the arsenic and sulfur content of third century sestertii and dupondii. If a very probable date range is desired instead of a certain one, some of the ranges of Table LXI could be narrowed considerably. For example, the range of Category V extends to A.D. 117 instead of to A.D. 68 solely because a single coin of Trajan, out of the sixteen analyzed, had the unusually high zinc content of 17.76%. If a given illegible coin is found to have a zinc content in the range from 19.9 to 17.5%, the probability that it was struck in the reign of Trajan is in fact very small. Hence a very probable date range for Category V is from A.D. 37 to A.D. 68. However, so few coins of most of the emperors have been analyzed that the construction of a systematic series of probable date ranges on a proper statistical basis is not possible at present.

Shown in Table LXII are estimates, from the categories and ranges of Table LXI, of date limits for the manufacture of the objects of Table LX. These estimates involve three assumptions, which are, that orichalcum coins were the immediate source of the metal for these objects, that the objects were made from coins without significant change in the composition of the alloys and that each of the objects was made during, or very shortly after, the period of issue of the coin or coins from which it was made. The very probable validity of the first assumption, on which the rest depend, has already been discussed. As to the validity of the second assumption, the small size of most of the objects would make it seem likely that they were fashioned from coins largely by cold working, which would not have caused any change of composition. Even if some annealing had been necessary, the change in composition probably would not have been significant. But Object No. 10, because of its size, could not have been made without melting coins together, and this would have caused some loss of zinc. However, a calculation shows that even if the original coins had lost ten per cent of their zinc content on fusion, the composition of the coins would still fall in the same category as the composition of the object. The same is true for more than half the



other objects. Even for those in which a change of category would occur, the change would usually not shift either the category or the date limits very much. For example, if the manufacture of Object No. 1 involved the fusion of a coin or coins and a ten per cent loss of zinc occurred, a calculation shows that the original coin or coins would have contained about 26.5% zinc, which would place them in Category I with the limits of A.D. 37 to A.D. 54 instead of Category II with the limits of 23 B.C. to A.D. 54. In other words only the lower limit would be changed. Likewise for Object No. 2, for which the shift would be from Category V to Category III with a change in the lower limit but not the upper limit. No technical arguments can be advanced to support the validity of the third assumption. It merely rests on considerations of probability, for it seems inherently much more probable that objects would have been fashioned from particular coins at a time when they were being abundantly circulated and were freely available, rather than at some later time. However, many of the upper limits of Table LXII allow a considerable margin for the possibility that objects made at a given time were in fact made from coins that were no longer being issued. For example, Object No. 12 could have been made as late as the reign of Commodus from a coin

TABLE LXII

## DATING OF VARIOUS OBJECTS FROM THEIR COMPOSITION

<i>Object No.</i>	<i>Category of Composition</i>	<i>Lowest Possible Limit of Date of Manufacture</i>	<i>Probable Upper Limit of Date of Manufacture</i>
1	II	23 B.C.	54 A.D.
2	V	37 A.D.	68 A.D.
3	VII	23 B.C.	138 A.D.
4	VIII	69 A.D.	117 A.D.
5	X	96 A.D.	138 A.D.
6	X	96 A.D.	138 A.D.
7	XII	81 A.D.	161 A.D.
8	XII	81 A.D.	161 A.D.
9	XII	81 A.D.	161 A.D.
10	XII	81 A.D.	161 A.D.
11	XV	98 A.D.	192 A.D.
12	XV	98 A.D.	192 A.D.

or coins of Trajan. Because of the various uncertainties involved, it is obvious that this method of dating orichalcum objects other than coins is capable of yielding only rough estimates. However, it appears to be the only method available when such objects cannot be dated from archaeological evidence.

In any investigation of the composition of orichalcum objects it should be realized that there are in existence forgeries of ancient objects composed of copper alloys containing zinc. Otto<sup>109</sup> has shown that various German museums possess a number of forgeries of prehistoric bronze objects composed of such alloys. His analyses show that most of them contain from ten to fifteen per cent zinc in addition to various proportions of tin and lead. Relative to the proportions of zinc the total proportions of tin and lead are usually so high that the composition of the alloys is clearly very different from that of ancient orichalcum or zinc bronze. There can be no doubt that these forgeries were cast from modern zinc bronzes.

Shown in Table LXIII are the results of analyses of various modern forgeries which were alleged to be ancient objects found in the Mediterranean region. All except No. 5 were analyzed by the author. The genuineness of Nos. 1 through 4 was questioned partly on the basis of style but chiefly because of the presence of suspiciously thin layers of corrosion products on the metal. Examination showed that the layer on each of these objects was not only abnormally thin for an object of such alleged antiquity but that the metal immediately

TABLE LXIII

ANALYSES OF FORGERIES OF ANCIENT OBJECTS COMPOSED  
OF COPPER ALLOYS CONTAINING ZINC

<i>Object No.</i>	<i>Copper %</i>	<i>Zinc %</i>	<i>Tin %</i>	<i>Lead %</i>	<i>Iron %</i>	<i>Nickel %</i>	<i>Total %</i>
1	69.07	23.53	1.90	4.64	0.64	—	99.78
2	78.83	11.73	5.04	3.24	0.56	0.38	99.78
3	83.25	4.87	7.36	4.40	0.15	—	100.03
4	68.67	15.34	10.33	4.45	1.00	0.16	99.95
5	81.75	10.5	5.89	1.7	—	—	99.8

<sup>109</sup> Otto, H., *Wissenschaftliche Zeitschrift der Martin-Luther-Universität Halle-Wittenberg*, VII (1957), pp. 203-230.

*Identifications*

1. Alleged Egyptian statuette said to be composed of bronze.
2. Alleged Etruscan statue said to be composed of bronze.
3. Alleged Greek statuette.
4. Alleged original bronze head of Germanicus.
5. Alleged coin of Julius Caesar.

underneath was free from the internal corrosion products normally present in genuine objects of this kind. The analyses confirmed the preliminary conclusions reached from the examination of the layers of corrosion products and the underlying metal.

It will be seen that the alloy of No. 1 is a leaded brass and not a bronze as alleged. Though the zinc content is that of early orichalcum, the proportions of tin and lead are much higher than in orichalcum containing a similar proportion of zinc. The alloy of No. 2 might be classed as a zinc bronze rather than a brass, but genuine Etruscan statuary bronze is a simple tin bronze containing very little lead and no more than traces of zinc. No. 3 was said to be an early Greek bronze, but genuine early Greek statuary bronze is a simple tin bronze very similar in composition to Etruscan statuary bronze. Furthermore, the metal of this object contained only traces of the various impurities usually found in appreciable proportions in ancient bronzes. The alloy of No. 4 might well be classed as a zinc bronze rather than a brass. This object was alleged to date from about A.D. 15, but analyses of genuine Roman statuary bronzes of the Imperial period show that they are always leaded tin bronzes containing very little zinc. Of course it might be argued that this was an exceptional object cast from orichalcum or ancient zinc bronze, but the analysis demolishes this argument since the alloy contains too little zinc and far too much tin and lead for orichalcum of the early part of the first century A.D. and too much zinc for ancient zinc bronze of later date. No. 5 was analyzed by Göbel,<sup>110</sup> who described the coin as follows:

<sup>110</sup> Göbel, F., *Ueber den Einfluß der Chemie auf die Ermittlung der Völker der Vorzeit oder Resultate der chemischen Untersuchung metallischen Alterthümer insbesondere der in den Ostseegouvernements vorkommenden, Behufs der Ermittlung der Völker, von welchen sie abstammen* (Erlangen, 1842), p. 30.

*Obv.*: Head with inscription, *C. Caesar Dictator*.

*Rev.*: Laurel-wreath, inside which is inscription,  
*veni, vidi, vici*.

Göbel apparently did not suspect that this might be a forgery, but no other example of a coin of this type with its suspicious inscription is known, and the results of the analysis clearly show that it is a forgery. Although the composition of the alloy falls within the range of composition of some late orichalcum, it is far different in composition from orichalcum of the Roman Republican period, as may be seen by comparing the results of this analysis with those in Table IV. However, it is possible that the metal for this forgery was obtained by melting down some genuine late orichalcum coins. This appears to be the only forgery of a Roman orichalcum coin shown to be such by the analysis of the alloy. Probably analysis could be used to prove the falseness of other forgeries of orichalcum coins.



NUMISMATIC NOTES AND MONOGRAPHS

No. 152

THE UNIVERSITY  
OF MICHIGAN

APR 9 1965

LIBRARY

CJ  
35  
.N9  
No. 152

THE BARBARIC TREMISSIS IN SPAIN  
AND SOUTHERN FRANCE  
ANASTASIUS TO LEOVIGILD

By WALLACE J. TOMASINI



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK

1964



# THE AMERICAN NUMISMATIC SOCIETY

*Founded 1858 · Incorporated 1865*

BROADWAY BETWEEN 155TH & 156TH STREETS

NEW YORK, N.Y., 10032

**PURPOSES:** The Society was founded for the collection and preservation of coins, medals, decorations and paper money and for the investigation of their history and other subjects connected therewith.

**MEMBERSHIP:** Applications for membership are welcomed from all interested in numismatics. Inquiries regarding membership should be addressed to the Secretary of the Society.

**DUES:** The annual dues for an Associate Membership are \$10.00. Issues of the *Notes and Monographs*, *Museum Notes*, *Hispanic Numismatic Series*, and *Numismatic Literature* are distributed to all members.

**PUBLICATIONS:** The *Numismatic Notes and Monographs* consist of separately issued publications, each on a single topic, of which usually several appear each year. *The American Numismatic Society Museum Notes* is a publication, irregular in appearance, consisting of brief notes and papers, principally on items in the Society's collections. *Numismatic Literature* is a quarterly listing current numismatic publications with abstracts of their content. *Numismatic Studies* is a series accommodating works in a larger format. The *Hispanic Numismatic Series*, published in cooperation with the Hispanic Society of America, consists of publications devoted to the coinage of the Iberian Peninsula, and is based on the collections of the Hispanic Society.

**MUSEUM:** The Society maintains a museum located in uptown Manhattan, New York City, which houses its offices, collections and library. Collections embrace coins of all periods from their inception to modern times, medals and decorations. Selections from its cabinets are on display in an exhibition. The library, consisting of about 20,000 volumes, covers all branches of numismatics.

The museum is open to Members and the public on Tuesdays, Wednesdays, Thursdays, Fridays and Saturdays. It is closed on Sundays and Mondays and the following holidays: New Year's Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Election Day, Thanksgiving Day and Christmas Day. The hours of the Library are from 9 A.M. to 5 P.M. The public exhibition is open from 10 A.M. to 5 P.M.

# NUMISMATIC NOTES AND MONOGRAPHS

*Number* 152





# The Barbaric Tremissis in Spain and Southern France Anastasius to Leovigild

By WALLACE J. <sup>John</sup>TOMASINI



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK  
1964

35  
35  
.N9  
no. 152)

ALL RIGHTS RESERVED BY  
THE AMERICAN NUMISMATIC SOCIETY

PRINTED IN GERMANY  
AT J. J. AUGUSTIN · GLÜCKSTADT

TO  
WALTER W. S. COOK,  
*who introduced me to the Visigoths and to Numismatics,*  
AND  
RICHARD OFFNER,  
*who taught me how to see.*



vii

V. LEGEND ASSOCIATION WITH VPW TYPES IN Æ3 AND Æ4 ISSUES .. .. .	271
VI. INCIDENCE OF VPW TYPES IN GOLD, SILVER AND BRONZE ..	275
VII. NUMBERS OF COINS STUDIED BY STYLE GROUPS AND BY COLLECTION .. .. .	283
VIII. STYLE GROUP PROGRESSIONS .. .. .	288
IX. QUANTITATIVE GRAPH OF FRENCH AND IBERIAN COLLECTIONS STUDIED .. .. .	289
X. FREQUENCY TABLE OF WEIGHTS OF COINS IN MAJOR GROUPS	290
Xa. GRAPH OF CHART X — AVERAGE WEIGHT IN LARGEST WEIGHT GROUP.. .. .	292
Xb. GRAPH OF CHART X — AVERAGE WEIGHT OF ALL SPECI- MENS OF KNOWN WEIGHT .. .. .	293
Xc-Xi. AVERAGE WEIGHTS IN STYLE GROUP PROGRESSIONS	294
XI. FREQUENCY TABLE OF WEIGHTS OF COINS IN COMBINED MAJOR AND SUB-GROUPS .. .. .	296
Xia. GRAPH OF CHART XI — AVERAGE WEIGHT IN LARGEST WEIGHT GROUP.. .. .	298
Xib. GRAPH OF CHART XI — AVERAGE WEIGHT OF ALL SPECI- MENS OF KNOWN WEIGHT .. .. .	299
INDEX TO LETTERED PLATES .. .. .	300
PLATES .. .. .	303

## FOREWORD

Anyone who attempts to study early sixth century coinage in the West must come to grips with the difficulty of separating fact from fiction. The endeavor is obfuscated not only by the small number of facts but by the larger number of hypotheses which have become accepted as fact. The student cannot help but be skeptical of the use of this numismatic material as evidence because of the uncertainty of attributions, the seemingly endless variety of type styles, the lack of any systematically studied or recorded hoards and the lack of any complete catalogue. This skepticism is aggravated by aesthetic prejudices towards non-classical forms. To see these coins as barbarous, nonclassical, ergo crude and ugly, is not to see them at all. This aesthetic blindness or narrowness has hindered numismatic understanding and has limited the usefulness of the numismatic material.

The increased knowledge of the coinage of the late Empire in the last thirty years has accelerated research in sixth century coinage. It has helped to clarify and alleviate many of the uncertainties of mint practices. It is possible to visualize a continuing tradition from imperial provincial to royal barbarian mints. Although this has increased our ability to postulate, to hypothesize, and to predict, it does not compensate for the factual lacunae. If the quality of nineteenth century *tremissis* attributions of Lenormant, or of Belfort, Prou, and Robert are compared with those of Reinhart and Le Gentilhomme, it is easy to become overconfident in the order and structure which contemporary scholarship has given to the field of barbarian numismatics. With increased intimacy with the material and increased knowledge of late imperial numismatics, the degree of error in interpretation and attribution of the material has narrowed. Lenormant's decisions in respect to the knowledge of his time are brilliant, no matter how false we may consider most of them to be today. Problems of stylistic attribution are so involved with the world of subjective reality that even the modern scholar must be



humbled by and compassionate for the failings of his predecessors. Connoisseurship is, when at its best, a mystical experience. It is this quality as well as the accumulation of erroneous hypotheses that has been detrimental or inhibiting to the understanding of the material in question.

In order for a mystical experience to be shared it must be structured. It must be translated into intelligible symbols of the material world. It must be made real. It must not be expressed in the form of declaratory but rather of explanatory sentences. Too often the questions of how and why are not anticipated and go unanswered. The articles of the late William Reinhart are a case in point. There are few who did as much to resolve the problems of barbarian coinage, and few who brought such judgment and ability to analyze and to evaluate. Nevertheless, the value of the contribution is marred somewhat by Reinhart's method of imparting his knowledge. This is particularly so in his mint attributions, where he presented his conclusions with little or no explanation. Nowhere did he reveal his subjective criteria; nowhere did he reveal his method of analysis. In order to continue or to extend Reinhart's provocative work it is necessary to begin at the beginning. It is not possible to build on his findings, since there is little indication of the paths of research he followed nor a list of which of his endeavors produced negative results. A study of his articles does not provide a full understanding of the material unless one accepts without questioning his conclusions, for they cannot be tested on the basis of the evidence he supplies.

Since I began my study of sixth century tremisses in the summer of 1956, many people have been more than kind and generous with their advice, knowledge and assistance. Most deserving of my gratitude are those officers and members of the American Numismatic Society and its Museum who were responsible for the establishment and organization of the Summer Seminar. It was as a recipient of one of the summer fellowships that I enjoyed the privilege of working with the barbaric coinage in the collections of the American Numismatic Society and the Hispanic Society of America, and every member of their curatorial and library staffs deserves my especial thanks. Dr. George C. Miles from the very beginning was a

mentor, confessor, critic and friend without whose patience, enthusiasm and encouragement a refugee from Italian Renaissance Studies never would have presumed to commit himself to this research project. My debt to him and to Mr. Philip Grierson of Gonville and Caius College, Cambridge University is inestimable. Mr. Grierson has given considerable time and attention to the reading and criticizing of my theories and manuscripts and has generously shared his photographic material. Most of all he has given me the benefit of his own knowledge of the material in question, as well as putting at my disposal his unpublished manuscript on the barbaric coinage in the Collection of the American Numismatic Society. Many of my conclusions in regard to the dating of the last VPW issues would not have evolved without the provocation of his own unpublished opinions on this matter.

The generosity of the Trustees of the American Philosophical Society made it possible for me to study the coinage in Spanish private and public collections. The intimacy with which I was to come to know these as well as the coins in the New York collections formed the basis of my opinions on sixth century tremisses. The Graduate College of the State University of Iowa must also be thanked for its confidence in my research by releasing me from my academic responsibilities through a Faculty Fellowship so that I could complete my manuscript.

To all of those who supplied photographs or graciously opened their collections to me I shall ever be grateful: M. Jean Lafaurie of the Cabinet des Médailles at the Bibliothèque Nationale in Paris; Dr. Joaquín M. de Navascués y de Juan, and Dr. Luis Vázquez de Parga of the Museo Arqueológico in Madrid; Dr. Leopoldo Torres Balbás of the Instituto de Valencia de Don Juan in Madrid; Don Luis Morales Oliver, Director of the Biblioteca Nacional in Madrid; Padre Luciano Rubio Calzón, Director of the Biblioteca del Real Monasterio de San Lorenzo de el Escorial; Dr. Samuel de los Santos Jener of the Museo Arqueológico Provincial in Córdoba; Dr. José Álvarez Sáenz de Buruaga, Director of the Museo Arqueológico in Mérida; Juan Lafita y Diaz of the Museo Arqueológico in Seville; and Joaquina Eguaras and Ángela Mendoza Eguaras of the Museo Arqueológico in Granada.

In Iowa, numerous members of the University Library staff have been helpful in the gathering of material and in arranging Inter-Library Loans, but especial thanks is deserved by Miss Ada Stofflet. Mr. Harry Buckley of Temple University was kind enough to assist in the making of the Charts, and Miss Judith Paetow of the University of Iowa executed the drawings.

This list would not be complete without mentioning the late Medievalist Professor William L. M. Burke, and my wife. Both gave unsparingly of their time and their patience in editing my manuscript, while in silent suffering they listened to my monologues on the Visigoths.

## BIBLIOGRAPHY, COLLECTIONS AND KEY TO ABBREVIATIONS

The names and short titles of books, articles and collections used in the corpus and throughout the book are here arranged in strictly alphabetical order.

- Adquisiciones en 1940-1945 — Adquisiciones del Museo Arqueológico Nacional (1940-1945)*, Madrid, 1947.
- ALFÖLDI, *ACILRE* — Andreas Alföldi, *A Conflict of Ideas in the Late Roman Empire*, Oxford, 1952.
- ALFÖLDI, *JRS* 1932 — Andreas Alföldi, "Helmet of Constantine with the Christian Monogram," in *Journal of Roman Studies*, XXII (1932), pp. 9-23.
- ALFÖLDI, *Political Propaganda* — Andreas Alföldi, "The Main Aspects of Political Propaganda in the Coinage of the Roman Republic," in *Essays in Roman Coinage presented to Harold Mattingly*, eds. R.A.G. Carson and C.H.V. Sutherland, Oxford, 1956, pp. 63-95.
- AMARDEL, *Les marques monétaires* — Gabriel Amardel, "Les marques monétaires de l'atelier de Narbonne au VI<sup>e</sup> siècle," in *Bulletin de la Commission archéologique de Narbonne*, 1902, pp. 119-162.
- AMARDEL, *Les Monnaies à Narbonne* — Gabriel Amardel, "Les Monnaies d'Anastase, de Justin et de Justinien frappées à Narbonne," in *Bulletin de la Commission archéologique de Narbonne*, 1898, pp. 133-153.
- AMARDEL, *Wisigothes de Narbonne* — Gabriel Amardel, "Les plus anciennes Monnaies Wisigothes de Narbonne," in *Bulletin de la Commission archéologique de Narbonne*, 1898, pp. 389-401.
- AMECOURT, *Châlon-sur-Saône* — Gustave de Ponton d'Amecourt, "Description raisonnée des monnaies mérovingiennes de Chalon-sur-Saône," in *Annuaire de la Société française de Numismatique et d'Archéologie*, 1873-1876, pp. 37-152.
- AMI — Coins in the collection of A. Morrocos, Idanha a Velha, as listed by W. Reinhart, *DJN* 1940.
- AMS — Coins in the collection of the Archivio Municipal, Seville.
- Anonymi Valesiani* — Anonymi Valesiani, in *Monumenta Germaniae Historica, Auctores Antiquissimi, IX, Chronica minora I*, T. Mommsen, Berlin, 1892.
- ANS — Coins in the collection of The American Numismatic Society.
- AVITUS — Alcini Ecdicii Aviti, Viennensis Episcopi, *Opera quae supersunt*, in T. Mommsen and R. Peiper, *Monumenta Germaniae Historica, Auct. Antiq. VI*, Berlin, 1883.
- AXTELL — Harold Lucius Axtell, *The Deification of Abstract Ideas in Roman Literature and Inscriptions*, Chicago, Univ. of Chicago Press, 1907.
- BABELON — Ernest Babelon, *Monnaies de la République Romaine*, Paris, 1886.
- BARCELONA — J. Amorós and A. Mata Berruezo, *Catálogo de las monedas visigodas del Gabinete Numismático de Cataluña*, Barcelona, 1952.

- BAUDRILLART — André Baudrillart, *Les Divinités de la Victoire en Grèce et en Italie*, Paris, 1894. This is also to be found in the *Bibli. des écoles franç. d'Athènes et de Rome*, fasc. 68, Paris, 1894.
- BEISSER — Josef Beisser, "Die Münzprägung der Ostgoten," in *Mitteilungen der Num. Gesell. in Wien*, IV, 11-12 (1946), pp. 138-140.
- BELFORT — Auguste de Belfort, *Description générale des Monnaies mérovingiennes*, 5 vols., Paris, 1892-95.
- BELTRÁN, *Suevia española* — Pio Beltrán Villagrasa, "Las monedas visigodas acuñadas en la Suevia española," in *Boletín de la Comisión Provincial de Monumentos históricos y artísticos de Orense*, V, Nos. 101-106 (March-Dec. 1915, Jan.-Feb. 1916), pp. 81-89, 97-104, 113-120, 129-135, 145-152, 161-174.
- BELTRÁN, *Zorita* — Pio Beltrán Villagrasa, "Monedas de Leovigild en el tesorillo de Zorita de los Canes (año 1945)," in *Numario Hispánico*, II, 3 (1953), pp. 19-52.
- BERGER — Samuel Berger, *Histoire de la Vulgate pendant les premiers siècles du Moyen Age*, Nancy, 1893.
- BERNHART, *Handbuch* — Max Bernhart, *Handbuch zur münzkunde der römischen kaiserzeit*, Halle, 1926.
- BERNHART, *Münzkunde* — Max Bernhart, *Münzkunde der römischen kaiserzeit*, Geneva, 1922.
- BERNHEIMER — R. Bernheimer, "An Ancient Oriental Source of Christian Sacred Architecture," *American Journal of Archaeology*, 1939, pp. 647-668.
- BERNOULLI — J. J. Bernoulli, *Die Bildnisse der römischen kaiser und ihrer angehörigen*, Stuttgart, 1882-1894.
- BINDING — Carl Binding, *Geschichte des Burgundisch-Romanischen Königreichs*, Leipzig, 1868.
- BIONDELLI — Bernardino Biondelli, *Sulle monete auree dei goti in Italia*, Milan, 1861.
- BLANCHET — Adrien Blanchet, *Les trésors de monnaies romaines et les invasions germaniques en Gaule*, Paris, 1900.
- BMC CORINTH — B. V. Head, *Catalogue of Greek Coins in the British Museum: Corinth*, London, 1889.
- BMCB — Warwick Wroth, *Catalogue of the Imperial Byzantine Coins in the British Museum*, London, 1908.
- BMCRE — Harold Mattingly, *Coins of the Roman Empire in the British Museum*, London, 1923-50.
- BMCRR — H. A. Grueber, *Coins of the Roman Republic in the British Museum*, London, 1910.
- BMCVOL — Warwick Wroth, *Catalogue of the Coins of the Vandals, Ostrogoths and Lombards, and of the Empires of Thessalonica, Nicaea and Trebizond in the British Museum*, London, 1911.
- BOAK — A.E.R. Boak, "Imperial Coronation Ceremonies of the Fifth and Sixth Centuries," in *Harvard Studies in Classical Philology*, XXX (1919), pp. 37-48.
- BORDOÑA, *Spanish Illumination* — J. Dominguez Bordoña, *Spanish Illumination*, New York, 1930.
- BORRELL — Max Borrell, "Coins of the Vandals in Africa," in *Numismatic Chronicle*, XVII (1855), pp. 3-12.

- BOUZA BREY — Fermin BouzaBrey, "Anillo signatario visigodo de la provincia de Lugo," in *Boletín de la Comisión Provincial de Monumentos históricos y artísticos de Lugo*, No. 4 (1942).
- BRUHL — Bruhl, "Les influences hellénistiques dans le triomphe romaine," in *Mélanges de l'École de Rome*, 1929, pp. 75-95.
- BRUNSMID — Josef Brunsmid, "Die münzen des Gepidenkönigs Kunimund," in *Numismatische Zeitschrift*, Wien, Bd. 57 (1924), pp. 1-5.
- BURY, *Invasion* — John B. Bury, *The Invasion of Europe*, London, 1928.
- BURY, *LRE* — John B. Bury, *History of the Later Roman Empire*, 2 vols., London, 1931.
- CAGNAC-CHAPOT — R. Cagnac and V. Chapot, *Manuel d'Archéologie Romaine*, 2 vols., Paris, 1916.
- CAHN — Julius Cahn, "Rheinische Merowinger-prägungen," in *Frankfurter Münzzeitung*, N.F. Bd. I, pp. 533-34.
- CAMPS CAZORLA, *Arte* — E. Camps Cazorla, "El arte hispano visigodo," in *Historia de España*, ed. R. Menéndez Pidal, III, Madrid, 1940, pp. 435-607.
- CAMPS CAZORLA, *Quintanilla* — E. Camps Cazorla, "El visigotismo de Quintanilla de las Viñas," in *Boletín del Seminario de Arte y Arqueología*, nos. 22-24 (Valladolid, 1939-40), pp. 125-134.
- CAMPS CAZORLA, *San Pedro de Nave* — E. Camps Cazorla, "El visigotismo de San Pedro de Nave," in *Boletín del Seminario de Estudios de Arte y Arqueología*, VII (Valladolid, 1940-41), pp. 73-80.
- CARLES-TOLRÁ — *Catálogo de la colección numismática Emilio Carles-Tolrá*, Antigua Librería Babra, Barcelona, 1936.
- CARSON, *NC 1950* — R.A.G. Carson, "A Roman Imperial Mint at Narbonne?" in *Numismatic Chronicle*, X (1950), pp. 144-148.
- CARSON, *SPRM* — R.A.G. Carson, "System and Product in the Roman Mint," in *Essays in Roman Coinage presented to Harold Mattingly*, eds. R.A.G. Carson and C.H.V. Sutherland, Oxford, 1956, pp. 227-239.
- CASSIODORUS — Cassiodorus Senatoris, *Variae*, in *Monumenta Germaniae Historica Auct. Antiq.*, I, ed. T. Mommsen, Berlin, 1894.
- CASSIODORUS, *Chronica* — Cassiodorus Senatoris, *Chronica*, in *Monumenta Germaniae Historica, Auctores Antiquissimi*, XI. *Chronica Minora*, II, ed. T. Mommsen, Berlin, 1892.
- CCL — Coins in the Collection of Costa Couvreur, Lisbon, as listed by W. Reinhart, *DJN 1940*.
- CCR — Edward A. Sydenham, *The Coinage of the Roman Republic*, London, 1952.
- CHABOUILLET, *Cat. des Poinçons* — Anatole Chabouillet, *Catalogue des poinçons, coins, et médailles du Musée Monétaire de la commission des monnaies et médailles*, Paris, 1833.
- CHABOUILLET, *Cat. gén.* — Anatole Chabouillet, *Catalogue général et raisonné des camées et pierres gravées de la Bibliothèque Impériale*, Paris, 1858.
- CHRON. CAESARAGUS. — Anon., *Chronicorum Caesaragustanorum Reliquae*, *Monumenta Germaniae Historica, Auctores Antiquissimi*, XI, *Chronica Minora*, II, ed. T. Mommsen, Berlin, 1894.
- CML — Coins in the Casa da Moeda, Lisbon, as listed by W. Reinhart, *DJN 1940*.
- COHEN — Henry Cohen, *Description historique des Monnaies frappées sous l'Empire romain*, Paris, 1892.

- COLVIN — Sidney Colvin, "Adventus Augusti: a Drawing attributed to Giovanni Antonio da Brescia," in *Papers of the British School at Rome*, VI, 3 (1913), pp. 171-173.
- CONRAT — Max Conrat, *Breviarum Alaricianum, Römisches Recht im Fränkischen Reich*, Leipzig, 1903.
- COURCELLE — Pierre Courcelle, *Histoire Littéraire des Grandes Invasions Germaniques*, Paris, 1948.
- COURTOIS — Christian Courtois, *Les Vandales et l'Afrique*, Paris, 1955.
- CRC — Coins in the Collection of C. R. Coruña as listed by W. Reinhart, *DJN* 1940.
- DAHN — Felix Dahn, *Westgothische Studien: Lex Visigothorum*, Würzburg, 1874.
- DAREMBERG-SAGLIO — Charles Daremberg and Edmond Saglio, *Dictionnaire des Antiquités Grecques et Romaines*, Paris, 1877-1919.
- DELBRUECK, *Consulardiptychen* — Richard Delbrueck, *Die Consulardiptychen und Verwandte Denkmäler*, Berlin, 1929.
- DELBRUECK, *Kaiserornat* — Richard Delbrueck, "Der Spätantike Kaiserornat," in *Die Antike*, VIII (1932), pp. 1-21.
- DERRIMAN, *Vandal* — J.P. Derriman, "Vandal Coins from Carthage," in *Numismatic Review*, II, 2 (Oct. 1944), p. 11.
- DEUBNER — L. Deubner, "Eine unbekannte Ara Pacis," in *Rom. Mitt.*, XLV (1930), pp. 37-42.
- DE URBEL — Justo Pérez de Urbel, *Los Monjes Españoles en la Edad Media*, 2 vols., Madrid, 1934.
- DIC — Collection of Mr. Douglas P. Dickie of Ridgewood, New Jersey.
- DICKIE — Douglas P. Dickie, "Merovingian Coins in the Collection of the American Numismatic Society," in *Museum Notes*, IV (1950), pp. 91-96.
- DILL, *Gaul* — Samuel Dill, *Roman Society in Gaul in the Merovingian Age*, London, 1926.
- DILL, *Roman Society* — Samuel Dill, *Roman Society in the Last Century of the Western Empire*, London, 1933.
- DO — Coins in the cabinet of The Dumbarton Oaks Research Library and Collection, Harvard University, in Washington, D.C.
- DUCHALAIS, *RN 1847* — A. Duchalais, "Observations sur quelques points de numismatique gauloise," in *Revue Numismatique*, no. 4 (1847), pp. 237-267.
- DUCHALAIS, *RN 1854* — A. Duchalais, "Triens de la Frise," in *Revue Numismatique*, no. 11, (1854), pp. 51-60.
- DUCHESNE, *Lib. pontif.* — Louis M. O. Duchesne, *Le Liber pontificalis*, Paris, 1955.
- EBERSOLT — J. Ebersolt, *Les arts somptuaires de Byzance, Étude sur l'art impérial de Constantinople*, Paris, 1923.
- ENNES — Ernesto Ennes, *O Gabinete Numismático*, Lisbon, 1927.
- ENNODIUS — Ennodius, *The Life of Saint Epiphanius*, trans. and ed. Sister G.M. Cock, in *The Catholic University of America Studies in Medieval and Renaissance Latin Language and Literature*, XIV, Washington, D.C., 1942.
- ENP — Coins in the Collection of Eduard Nieport, Porto, as listed in W. Reinhart, *DJN* 1940.
- ENSSLIN — Wilhelm Ensslin, *Theoderich der Große*, Munich, 1947.
- FALLUE — Léon Fallue, *Annales de la Gaule avant et pendant la domination romaine*, Paris, 1864.

- FINK — Robert O. Fink, A.S. Hoey, and W.F. Snyder, "The Feriale Duranum," in *Yale Classic Studies*, VII (1940), pp. 1-222.
- FLOREZ — Henrique Florez, *Medallas de las Colonias, Municipios y Pueblos antiguos de España hasta hoy no publicadas, con las de los Reyes Godas*, III, Madrid, 1773.
- FRIEDLAENDER, *Ostgothen* — Julius Friedlaender, *Die Münzen der Ostgothen*, Berlin, 1844.
- FRIEDLAENDER, *Vandalen* — Julius Friedlaender, *Die Münzen der Vandalen*, Leipzig, 1849.
- FROTHINGHAM — A. L. Frothingham, Jr., "A Revised List of Roman Memorial and Triumphal Arches," in *American Journal of Archaeology*, VIII (1904), pp. 1-34.
- GAGÉ, *RA 1930* — Jean Gagé, "La Victoria Augusti et les Auspices de Tibère," in *Revue Archéologique*, XXXII (July-Oct., 1930), pp. 1-35.
- GAGÉ, *RH 1933* — Jean Gagé, "La Théologie de la Victoire Impériale," in *Revue Historique*, CLXXI (Jan.-July, 1933), pp. 1-43.
- GARCÍA Y VILLADA — Z. García y Villada, *Historia eclesiástica de España*, Madrid, 1929-1932.
- GNECCHI, *Coin Types* — F. Gnechi, *Coin Types of Imperial Rome*, London, 1908.
- GNECCHI, *RIN 1904* — F. Gnechi, "Tarraco o Ticinium e Mediolanum," in *Rivista Italiana di Numismatica*, 1904, pp. 35-40.
- GOFFART — Walter Goffart, "Byzantine Policy in the West under Tiberius II and Maurice: The Pretenders Hermenegild and Gundovald," in *Traditio*, XIII (1957), pp. 73-118.
- GOODACRE, *Bronze Coinage* — Hugh Goodacre, *The Bronze Coinage of the Late Roman Empire*, London, 1922.
- GOODACRE, *Byzantine* — Hugh Goodacre, *A Handbook of the Coinage of the Byzantine Empire*, London, 1928-33.
- GÖRRES, *Byzantinische Besitzungen* — Franz Görres, "Die byzantinischen Besitzungen an den Küsten des spanisch-westgotischen Reiches (554-624)," in *Byzantinische Zeitschrift*, XVI (1907), pp. 515-538.
- GÖRRES, *Hermenegild* — Franz Görres, "Kritische Untersuchungen über den Aufstand und das Martyrium des westgotischen Königssohnes Hermenegild," in *Zeitschrift für die historische Theologie*, 1873, pp. 3-109.
- GRAEF — Paul Graef, "Triumph — und Ehrenbogen," *Denkmäler der Klassischen Altertums*, III, ed. A. Baumeister, Munich, 1886-1889.
- GRANT, *Anniversary Issues* — Michael Grant, *Roman Anniversary Issues*, Cambridge, 1950.
- GRANT, *Imperium* — Michael Grant, *From Imperium to Auctoritas*, Cambridge, 1946.
- GRANT, *RIM* — Michael Grant, *Roman Imperial Money*, London, 1954.
- GRANT, *Tiberius* — Michael Grant, *Aspects of the Principate of Tiberius*, New York, 1950.
- GREGORY OF TOURS — O. M. Dalton, *History of the Franks by Gregory of Tours*, Oxford, 1927.
- GRIERSON, *Commerce* — Philip Grierson, "Commerce in the Dark Ages: A Critique of the Evidence," in *Transactions of the Royal Historical Society*, IX (1959), pp. 123-140.



- GRIERSON, *Medieval Numismatics* — Philip Grierson, "Report on Medieval Numismatics," in *Rapports, Congrès International de Numismatique, Paris 6-II, Juillet, 1953*, I, pp. 55-101.
- GRIERSON, *NC 1953* — Philip Grierson, "Visigothic Metrology," in *Numismatic Chronicle*, VIII, (1953) pp. 74-87.
- GRIERSON, *NH 1955* — Philip Grierson, "Una Ceca Byzantina en España," in *Numario Hispánico*, IV, no. 8 (1955), pp. 305-314.
- GRIERSON, *Technology* — Philip Grierson, "Note on Stamping of Coins and other Objects," in *A History of Technology*, II, eds. C. Singer, E. E. Holmyard, A. R. Hall, and T. I. Williams, London, 1956, pp. 485-492.
- HALPHEN — Louis Halphen, *Les Barbares*, Paris, 1926.
- HEISS — Aloiss Heiss, *Description générale des monnaies de rois Wisigoths d'Espagne*, Paris, 1872.
- HELBIG — Wolfgang Helbig, *Guide to the Public Collections of Classical Antiquities in Rome*, Leipzig, 1896.
- HILLGARTH, — J. N. Hillgarth, "La Conversión de los Visigodos Notas Críticas," in *Analecta sacra Tarraconensia*, XXXIV (1961), pp. 21-46.
- HODGKIN, *Cassiodorus* — Thomas Hodgkin, *The Letters of Cassiodorus*, London, 1886.
- HODGKIN, *Italy* — Thomas Hodgkin, *Italy and Her Invaders (476-535)*, 8 vols., Oxford, 1885.
- HODGKIN, *Theodoric* — Thomas Hodgkin, *Theodoric the Goth*, New York, 1891.
- HSA — Collection of the Hispanic Society of America, formed by Mr. Archer M. Huntington, now on deposit in the Museum of the American Numismatic Society, New York.
- HVK — Coins in the Hess Verst. Katalog Juni 1922 as listed in W. Reinhart, *DJN 1940*.
- HVP — Coins in the Collection of Hans H. Völkers, Prague as listed in W. Reinhart, *DJN 1940*.
- IMHOOF-BLUMER — Friedrich Imhoof-Blumer, *Porträtköpfe auf römischen münzen der republik und der kaiserzeit*, Leipzig, 1892.
- ISIDORE OF SEVILLE — Isidore of Seville, *Historia Gothorum*, in *Monumenta Germaniae Historica, Auctores Antiquissimi*, XI, *Chronica Minora*, II., ed. T. Mommsen.
- JAHN — Albert Jahn, *Die Geschichte der Burdundionen und Burgundiens bis zum ende der 1. dynastie*, Halle, 1874.
- JH — Coins in the collection of The Johns Hopkins University, Baltimore, Maryland.
- JOHN OF BICLAR — Johannis abbatis Biclarensis, *Chronica a DLXVII-DXC*, in *Monumenta Germaniae Historica, Auctores Antiquissimi*, XI, *Chronica Minora*, II, ed. T. Mommsen, Berlin, 1894, pp. 163-207.
- JONES — H. Stuart Jones, "Notes on Roman Historical Sculptures," in *Papers of the British School at Rome*, III, 2 (1905), pp. 215-271.
- JORDANES — Jordanes, *The Gothic History*, trans. C. C. Mierrow, Princeton, 1915.
- JUSUÉ — Eduardo Jusué, "Monedas de oro de la época visigótica halladas en la provincia de Santander," in *Boletín de la R. Acad. de la Historia*, LVII (1910), pp. 482-487.

- KÄHLER, *JDAI* 1936 — Heinz Kähler, "Dekorative Arbeiten aus der Werkstatt des Konstantinsbogens," in *Jahrbuch des Deutschen Archäologischen Instituts*, LI (1936), pp. 180-201.
- KÄHLER, *Pergamon* — Heinz Kähler, *Der Große Fries von Pergamon*, Berlin, 1948.
- KÄHLER, *Personificationem* — Unpubl. diss. (Königsburg, 1910) by H. Kähler, "Personificationem abstrecker Begriffe auf römischen Münzen."
- KEARY — C. F. Keary, "The Coinage of Western Europe: From the Fall of the Western Empire till the Accession of Charlemagne," in *Numismatic Chronicle*, XVIII (1878), pp. 48-72.
- KENT — J.P.C. Kent, "Gold Coinage in the Late Roman Empire," in *Essays in Roman Coinage presented to Harold Mattingly*, eds. R.A.G. Carson and C.H.V. Sutherland, Oxford, 1956, pp. 190-204.
- KFM — Coins in the former collection of the Kaiser Friedrich-Museum, Berlin, as listed in W. Reinhart, *DJN* 1940.
- KING, *Liturgies* — Archdale A. King, *Liturgies of the Primatial Sees*, Milwaukee, 1957.
- KRAUS — Ferdinand F. Kraus, *Die Münzen Odovacars und des Ostgotenreiches in Italien*, Halle, 1928.
- KRÜCKE — A. Krücke, *Der Nimbus und verwandte attribute in der Frühchristlichen Kunst*, Strassburg, 1905.
- LANCKORONSKI — Leo Maria Lanckoronski, *Das Römische Bildnis in Meisterwerken der Münzkunst*, Amsterdam, 1944.
- LBM — Collection of the British Museum, London.
- LE BLANC — F. Le Blanc, *Traité historique des Monnoies de France*, Paris, 1690.
- LE BRUN — Pierre Le Brun, *Explication litterale, historique et dogmatique des prieres et des ceremonies suivant les anciens auteurs... de la Messe*, 4 vols., Paris, 1726.
- LEDERER, *DM* 1935 — Philip Lederer, "Ticinum (Pavia) also Münzstätte unter Odovacar," in *Deutsche Münzblätter*, Jhg. 55 (1935), pp. 357-361.
- LE GENTILHOMME, *RN* 1943 — Pierre Le Gentilhomme, "Le monnayage et la circulation monétaire dans les royaumes barbares en Occident (Ve-VIIIe siècle)," in *Revue Numismatique*, VII (1943), pp. 46-112; VIII (1944), pp. 13-59.
- LE GENTILHOMME, *RN* 1936 — Pierre Le Gentilhomme, "Trouvaille de monnaies d'or des Mérovingiens et des Wisigoths faite à Bordeaux en 1803," in *Revue Numismatique*, 1936, pp. 87-133.
- LEITE DE VASCONCELLOS, *Lisbon* — Jose Leite de Vasconcellos, *Gabinete Numismático da Bibliotheca Nacional de Lisboa, Notas e documentos. I. Moedas de ouro da epocha germanica*, Coimbra, 1902.
- LENORMANT — Charles Lenormant, "Lettres à M. de Saulcy sur les plus anciens monuments numismatiques de la série mérovingienne," in *Revue Numismatique*, 1848-1854.
- Lex Burgundia* — *Leges Burgundionum* in *Monumenta Germanica Historiae, Legum Sectio I*, ed. L. R. de Salis, Tom. II, Pars I, Hannover, 1892.
- Lex Visigothorum* — *Leges Visigothorum*, in *Monumenta Germanica Historiae, Legum Sectio I*, ed. Karolus Zeumer, Tom. I, Hannover, 1902.
- LONJA DEL ALMIDÓN — *Catálogo ilustrado de la Colección de Monedas... Lonja del Almidón*, Madrid, 1936.

- L'ORANGE, *Apotheosis* — Hans Peter L'Orange, *Apotheosis in Ancient Portraiture*, Oslo, 1947.
- L'ORANGE, *Cosmic Kingship* — H. P. L'Orange, *Studies on the Iconography of Cosmic Kingship in the Ancient World*, Oslo, 1953.
- L'ORANGE, *Konstantinsbogens* — H. P. L'Orange, *Der Spätantike Bildschmuck des Konstantinsbogens*, Berlin, 1939.
- LRBC — P. V. Hill, R. A. G. Carson, and J. P. C. Kent, *Late Roman Bronze Coinage (A. D. 324-498)*, London, 1960.
- MAHUDEL — Mahudel, *Dissertation historique sur les monnoyes antiques d'Espagne*, Paris, 1725.
- MAILLARD, *Alise* — Charles-Hippolyte Maillard de Chambure, "Rapports sur les fouilles faites à Alise en 1839," in *Memoires de la Commission des Antiquités de la Côte-d'Or*, I, pp. 101-127, 195-211.
- MAB — Collection of the Museo Arqueológico, Barcelona, as listed in W. Reinhart, *DJN* 1940.
- MAC — Collection of the Museo Arqueológico, Córdoba.
- MAM — Collection of the Museo Arqueológico Nacional, Madrid.
- MAQQARÍ — *The History of the Mohammedan Dynasties in Spain . . . by Ahmed ibn Mohammed al-Makkari*, trans. Pascual di Gayangos, London, 1840-1843.
- MARTÍNEZ — J. Martínez Santa-Olalla, "Notas para un ensayo de sistematización de la arqueología visigoda en España," in *Archivo Español de Arte y Arqueología*, May-Aug. 1934, pp. 139-176.
- MATEU Y LLOPIS — Felipe Mateu y Llopis, *Catálogo de las monedas previsigodas y visigodas del Gabinete Numismático del Museo Arqueológico Nacional*, Madrid, 1936.
- MATEU Y LLOPIS, *Barcelona* — F. Mateu y Llopis, "Hallazgos Monetarios (IV)," in *Ampurias*, VII-VIII (Barcelona, 1946), pp. 233-276. Contains an inventory of the cabinet of the Real Academia de la Historia, Barcelona.
- MATEU Y LLOPIS, *Bizantina* — F. Mateu y Llopis, "La Moneda bizantina en España," in *Crónica del III Congreso Arqueológico del sudeste Español*, Murcia, 1947, pp. 310-320.
- MATEU Y LLOPIS, *Fórmulas* — F. Mateu y Llopis, "La fórmulas y los símbolos cristianos en los tipos monetales visigodos," in *Analecta Sacra Tarraconensia*, XIV (1942), pp. 75-96.
- MATTINGLY, *Roman Coins* — Harold Mattingly, *Roman Coins*, London, 1928.
- MAURICE — Jules Maurice, *Numismatique Constantinienne*, Paris, 1908-1912.
- MAYER — E. Mayer, *Historia de las Instituciones sociales y políticas de España y Portugal durante los siglos V a XIV*, Madrid, 1926.
- MCA — Coins in the collection of the Musée Calvet, Avignon, as listed in W. Reinhart, *DJN* 1940.
- MEL — Coins in the collection of the Museu Etnológico, Lisbon, as listed in W. Reinhart, *DJN* 1940.
- MENÉNDEZ PIDAL — Ramón Menéndez Pidal, ed., *Historia de España*, III, *España Visigoda*, Madrid, 1940.
- MILES — George C. Miles, *The Coinage of the Visigoths of Spain: Leovigild to Achila II*, New York, 1952.
- MML — Coins in the collection of the Museu Municipal, Lisbon, as listed in W. Reinhart, *DJN* 1940.

- MOMMSEN, *Monnaie Romaine* — T. Mommsen, *Histoire de la monnaie romaine*, Paris, 1865-75.
- MONNERET DE VILLARD — Ugo Monneret de Villard, "La Monetazione nell'Italia barbarica," in *Rivista Italiana di Numismática*, XXXII (1919), pp. 22-38, 73-112, 125-138; XXXIII (1920), pp. 169-232; XXXIV (1921), pp. 191-218.
- MONTI-LAFFRANCHI, *Tarraco* — Pompeo Monti and Lodovico Laffranchi, "Tarraco o Ticinum?" in *Bollettino di Numismática*, nos. 3-4 (1903), pp. 35-40; no. 1 (1904), pp. 2-8; no. 10 (1904), pp. 113-115.
- MONTI-LAFFRANCHI, *Ticinum* — P. Monti and L. Laffranchi, "Le sigle monetarie della zecca di 'Ticinum' dal 274 al 325," in *Bollettino di Numismática*, no. 8 (1903), pp. 79-81; nos. 9-10 (1903), pp. 89-95; no. 3 (1904), pp. 25-27.
- NMK — Collection of the Nationalmuseum, Copenhagen, as listed in W. Reinhart, *DJN* 1940.
- NOCK — Arthur Darby Nock, "The Emperor's Divine Comes," in *Journal of Roman Studies*, XXXVII (1947), pp. 102-116.
- OROSIUS — Paulus Orosius, *Seven Books of History against the Pagans*, trans. I. W. Raymond, New York, 1930.
- PAIS — Ettore Pais, *Fasti Triumphales Populi Romani*, Rome, 1920.
- PALOL DE SALELLAS — Pedro Palol de Salellas, "Essencia del arte hispánico de época visigoda," in *Settimane di Studio del Centro Italiano di Studi sull'Alto Medioevo*, III (1955), pp. 65-126.
- PBN — Collection of the Cabinet des Médailles, Bibliothèque Nationale, Paris.
- PEARCE, *NC* 1932 — J. W. E. Pearce, "Issues of the Urbs Roma siliqua at Treveri and Vota siliquae of Gratian struck at Treveri," in *Numismatic Chronicle*, XI (1932), pp. 245-266.
- PEARCE, *NC* 1937 — J. W. E. Pearce, "Eugenius and his Eastern Colleagues," in *Numismatic Chronicle*, XVII (1937), pp. 1-27.
- PEARCE, *NC* 1940 — J. W. E. Pearce, "Issues of the solidi VICTORIA AVGG from Treveri," in *Numismatic Chronicle*, XX (1940), pp. 138-161.
- PEARCE, *NC* 1943 — J. W. E. Pearce, "A Half-siliqua of the Treveran Mint," in *Numismatic Chronicle*, III (1943), pp. 97-99.
- PEARCE, *NC* 1944 — J. W. E. Pearce, "Lugdunum; Siliqua coinage of Valentinian II and Eugenius," in *Numismatic Chronicle*, IV (1944), pp. 45-57.
- PEARCE, *NR* 1946 — J. W. E. Pearce, "The Portraits of the Emperor Gratian (Portraiture on Late Fourth Century Roman Coins)," in *Numismatic Review*, April, 1946, pp. 61-62.
- PEARCE, *Romain Coinage* — J. W. E. Pearce, *The Roman Coinage from A.D. 364 to 423*, London, 1933. This appeared as a series of articles in the *Numismatic Circular* from 1931-1933.
- PÉREZ PUJOL — Eduardo Pérez Pujol, *Historia de las instituciones sociales de la España Goda*, Valencia, 1896.
- PG — Collection of Philip Grierson, Gonville and Caius College, Cambridge, England.
- PPC — Coins in the collection of Paiva Pessoa, Castelo Branco, as listed in W. Reinhart, *DJN* 1940.

- PROCOPIUS — Procopius Caesariensis, *Opera Omnia*, Leipzig, 1905.
- PROU, Maurice Prou — *Les monnaies mérovingiennes* (Catalogue des monnaies françaises de la Bibliothèque Nationale), Paris, 1892.
- PROU, RN 1896 — Maurice Prou, "Monnaies mérovingiennes acquises par la Bibliothèque Nationale de 1893 à 1896," in *Revue Numismatique*, IV (1896), pp. 425-446.
- PW — Pauly-Wissowa, *Realencyclopädie der Classischen Altertumwissenschaft*, Stuttgart, 1958.
- RATTO — *Monnaies Byzantines et d'autres pays contemporaines à l'Époque Byzantine — La plus riche et la plus vaste collection privée*, Rodolfo Ratto, Lugano, 9 Dec. 1930.
- REINHART, AEA 1945 — Wilhelm Reinhart, "Nuevas aportaciones a la numismática visigoda," *Archivo Español de Arqueología*, XVIII (1945), pp. 212-235.
- REINHART, Arte — W. Reinhart, "El arte monetario visigodo. Las monedas como documentos," in *Boletín del Seminario de Estudios de Arte y Arqueología* (Universidad de Valladolid, Facultad de Historia), X (1943-44), pp. 53-57.
- REINHART, DJN 1940 — W. Reinhart, "Die Münzen des westgotischen Reiches von Toledo," in *Deutsches Jahrbuch für Numismatik*, 1940-41, pp. 66-101.
- REINHART, Germania 1941 — W. Reinhart, "Die svebischen und westgotischen Münzen als kulturhistorische Denkmäler," in *Germania*, 25 (1941), pp. 188-193.
- REINHART, Germanische Helme — W. Reinhart, "Germanische Helme in westgotischen Münzbildern," in *Jahrbuch für Numismatik und Geldgeschichte*, II (1950/51), pp. 43-46.
- REINHART, Madrid — W. Reinhart, "Las monedas Visigodas del Museo Arqueológico Nacional," in *Mitteilungen der Bayer. Numismatischen Gesellschaft*, LV (1937), pp. 191-197.
- REINHART, Merowinger — W. Reinhart, "Die Früheste Münzprägung im Reiche der Merowinger," in *Deutsches Jahrbuch für Numismatik*, 1939, pp. 37-56.
- REINHART, Suevas — W. Reinhart, "El Reino Hispánico de los Suevos y sus monedas," in *Archivo Español de Arqueología*, no. 49 (1942), pp. 308-328.
- REINHART, Svebenreiches — W. Reinhart, "Die Münzen des Svebenreiches," in *Mitteilungen der Bayer. Numismatischen Gesellschaft*, 1937, pp. 151-191.
- REINHART, Tolosanischen — W. Reinhart, "Die Münzen des tolosanischen Reiches der Westgoten," in *Deutsches Jahrbuch für Numismatik*, Jhg. I, 1938, pp. 107-135.
- REINHART, Visigodos — W. Reinhart, "Sobre el asentamiento de los Visigodos en la Península," in *Archivo Español de Arqueología*, XVIII, no. 59 (1945), pp. 124-139.
- RIC — Harold Mattingly, E. A. Sydenham and others, *Roman Imperial Coinage*, London, 1923-51.
- RIC IX — J. W. E. Pearce, *Valentinian I - Theodosius I*, Vol. IX in *The Roman Imperial Coinage*, eds. H. Mattingly, C. Sutherland, R. A. G. Carson, London, 1951.
- ROBERT, Languedoc — P. Charles Robert, *Numismatique de la Province de Languedoc*, II, *Période Wisigothe et Franque*, Toulouse, 1879.

- ROBERT, *Maurice Tibere* — Charles Robert, "Sur la prétendue restauration du pouvoir de Maurice Tibere dans la Province," *Mémoire de l'Institut National de France Académie des l'Inscription et Belle-Lettre*, XXX, 2e partie (1883), pp. 397-438.
- ROSCHER — *Ausführliches Lexikon der Griechischen und Römischen Mythologie*, ed. W. H. Roscher, Leipzig, 1897-1902.
- ROSSIGNOL — Claude Rossignol, "Le Trésor de Gourdon, lettre à M. de Salvandy, Ministre de l'instruction publique, 28 Dec. 1845," in *Mémoires de la Société d'Histoire et d'Archéologie de Chalon-s.-S.*, I (1846), pp. 287-307.
- RSL — Former collection of the late R. Shore, Lisbon, as listed in W. Reinhart, *DJN* 1940.
- RUELLE — Charles Emile Ruelle, *Bibliographie général des Gaules*, Paris, 1886.
- RUGGIERI — J. S. Ruggieri, "Alle Fonti della cultura ispanovisigótica," in *Studi Medievali*, 16 (1943-1950), pp. 1-48.
- SABATIER — Justin Sabatier, *Description générale des monnaies byzantines frappées sous les empereurs d'Orient depuis Arcadius jusqu'à la prise de Constantinople par Mahomet II*, Paris, 1862.
- SABATIER, *Iconographie* — J. Sabatier, *Iconographie d'une collection choisie de cinq mille médailles romaines, byzantines et celtibériennes*, St. Petersburg, 1847.
- SABATIER, *Production* — J. Sabatier, *Production de l'or, de l'argent et du cuivre chez les anciens et Hôtels Monétaires des Empires romain et byzantin*, Paris, 1850.
- SAN — Collection of the Société Archéologique, Narbonne, as listed in W. Reinhart, *DJN* 1940.
- SCHLUNK — Helmut Schlunk, "Relaciones entre la Península Ibérica y Bizancio durante la época visigoda," in *Archivo Español de Arqueología*, XVIII, no. 60 (1945), pp. 177-204.
- SCHLUNK, *Observaciones* — Helmut Schlunk, "Observaciones en torno al problema de la miniatura visigoda," in *Archivo Español de Arte*, no. 71 (1945).
- SCHLUNK, *Visigodo* — Helmut Schlunk, "Arte Visigodo," in *Ars Hispaniae, Historia Universal del Arte Hispánico*, II, Madrid, 1947.
- SCHRAMM — Percy Ernest Schramm, *Herrschaftszeichen und Staatssymbolik*, in *Schriften der Monumenta Germaniae Historica*, Bd. XIII, Stuttgart, 1955.
- SCOTT, *Flavians* — Kenneth Scott, *The Imperial Cult under the Flavians*, Berlin, 1936.
- SEYMOUR — William Wood Seymour, *The Cross in Tradition, History, and Art*, New York, 1898.
- SIDONIUS APOLLINARIS — *The Letters of Sidonius*, trans. and ed. O. M. Dalton, Oxford, 1915.
- SMM — Coins in the collection of the Staatl. Münzsamml., Munich, as listed in W. Reinhart, *DJN* 1940.
- STEVENS, *Sidonius* — Courtney E. Stevens, *Sidonius Apollinaris and his Age*, Oxford, 1933.
- STROHEKER, *Leowigild* — K. Stroheker, "Leowigild: Aus einer Wendezeit westgotischer Geschichte," *Die Welt als Geschichte*, V (1939), pp. 446-485.
- TAYLOR — Lily Ross Taylor, *The Divinity of the Roman Emperor*, Middletown, Connecticut, 1931.

- THOMPSON — E. A. Thompson, "The Conversion of the Visigoths to Catholicism," in *Nottingham Medieval Studies*, IV (1960), pp. 1-35.
- TOLSTOÏ — I. I. Tolstoï, *Monnaies Byzantines*, St. Petersburg, 1913.
- TOYNBEE, *Hadrianic* — Jocelyn M. C. Toynbee, *The Hadrianic School*, Cambridge, 1934.
- TOYNBEE, *JRS* 1947 — J. M. C. Toynbee, "Roma and Constantinopolis in Late Antique Art from 312 to 365," in *The Journal of Roman Studies*, XXXVII (1947), pp. 135-144.
- TOYNBEE, *Picture-language* — J. M. C. Toynbee, "Picture-language in Roman Art and Coinage," in *Essays in Roman Coinage presented to Harold Mattingly*, eds. R. A. G. Carson and C. H. V. Sutherland, Oxford, 1956, pp. 205-226.
- TROUSSEL — Marcel Troussel, "Les monnaies vandales d'Afrique découvertes de Bou-Lelate et du Hamma," in *Recueil des Notices et Mémoires de la Société archéologique du département de Constantine*, LXVII (1950-51), pp. 147-194.
- ULRICH-BANSA — Oscar Ulrich-Bansa, *Moneta Mediolanensis (352-498)*, Venice, 1949.
- VÁZQUEZ DE PARGA — Luis Vázquez de Parga, "Joyas Bajorromanas y de la Temprana Edad Media," in *Adquisiciones en 1940-1945*, pp. 128-130.
- VDJ — Collection of the Instituto de Valencia de Don Juan, Madrid, as listed in W. Reinhart, *DJN* 1940, and F. Mateu y Llopis, "Las monedas visigodas del Instituto de Valencia de Don Juan (Madrid)," in *Ampurias*, XIII (1951), pp. 123-134.
- VELÁZQUEZ — Luis Joseph Velázquez, *Congeturas sobre las medallas de los reyes Godos y Suevos de España*, Málaga, 1759.
- VERMEULE, *Ancient Dies* — C. C. Vermeule, "Some Notes on Ancient Dies and Coining Methods," London, 1954. This is a reprint of the material which appeared in the *Numismatic Circular* in 1953 and 1954.
- VERMEULE, *Num. Circ.* 1952 — C. C. Vermeule, "Copying in Imperial Roman Die Designs," in *Numismatic Circular*, July, 1952, pp. 356-357.
- VERMEULE, *Num. Circ.* 1956 — C. C. Vermeule, "Roman Numismatic Art — A.D. 200-400," in *Numismatic Circular*, Nov.-Dec., 1956, pp. 473-480, 517-522; Jan., 1957, pp. 1-5.
- VERMEULE, *Victoria* — C. C. Vermeule, "Aspects of Victoria on Roman Coins, Gems, and in Monumental Art," in *Numismatic Circular*, Sept., 1957, pp. 357-362; Dec., 1957, pp. 537-539; Feb., 1958, pp. 33-34; April, 1958, pp. 94-96; June, 1958, pp. 138-141.
- Visigothic Code* — *The Visigothic Code*, trans. S. P. Scott, Boston, 1910.
- VOETTER — Otto Voetter, "Zur Streitfrage ob Tarraco oder Ticinum," in *Numismatische Zeitschrift* (Wien), 59 (1926), pp. 145-155.
- VQR — *Catálogo de la Colección de monedas y medallas de Manuel Vidal Quadras y Ramón de Barcelona*, I, Barcelona, 1892.
- WALTERS, *Engraved Gems and Cameos* — H. B. Walters, *Catalogue of the Engraved Gems and Cameos, Greek, Etruscan and Roman in the British Museum*, London, 1926.
- WALTERS, *Select Bronzes* — H. B. Walters, *Select Bronzes, Greek, Roman and Etruscan in the British Museum*, London, 1915.
- WEBB, *NC* 1921 — Percy H. Webb, "Third Century Roman Mints and Marks," in *Numismatic Chronicle*, XV (1921), pp. 226-293.

- WEBB, NC 1929 — P. H. Webb, "The Pre-Reform Coinage of Diocletian and his Colleagues," in *Numismatic Chronicle*, IX (1929), pp. 191-217.
- WISSOWA, *Religion und Kultus* — Georg Wissowa, *Religion und Kultus der Römer*, Munich, 1912.
- WISSOWA, *Römischen Religions* — Georg Wissowa, *Gesammelte Abhandlungen zur Römischen Religions und Stadtgeschichte*, Munich, 1904.
- WLM — Collection of the Württembergisches Landesmuseum, Stuttgart, as listed in W. Reinhart, *DJN* 1940.
- WR — Coins in the collection of the late Wilhelm Reinhart as listed in W. Reinhart, *DJN* 1940. The Reinhart collection has been disposed of and wherever possible the present owners have been identified.
- ZEISS, *Grabfunde* — Hans Zeiss, *Die Grabfunde aus dem Spanischen Westgotenreich*, Berlin, 1934.
- ZIEGLER — A. K. Ziegler, *Church and State in Visigothic Spain*, Washington, D. C., 1930.
- Zorita de los Canes — Juan Cabré y Aguilo, *El Tesorielo Visigodo de Trientes de las Excavaciones del plan Nacional de 1944-1945 en Zorita de los Canes (Guadalajara)*, Madrid, 1946.





## ANTECEDENTS FOR THE SIXTH CENTURY TREMISSIS

Until the issues of Tiberius II Constantinus (578–582) there were only two reverse types used for the tremissis throughout the Mediterranean world in the sixth century. The first, which is peculiar to Byzantine Imperial currency and also found in Ostrogothic coins, is the frontal Victory holding in one hand a wreath-crown and in the other a *globus cruciger*, hereafter designated by the initials “VGC”. The second, which has become traditionally associated with the barbarian kingdoms in the West, is the old pagan striding Victoria holding in one hand outstretched before her a wreath-crown, while with the other she holds a palm branch against her shoulder. This will be designated by the initials “VPW”. These types represent two distinct versions of an old imperial personification, the Victoria Augusti.<sup>1</sup>

The pagan Victoria tremissis (VPW) has been unanimously attributed to western mints as a product of the various barbarian Kingdoms; Ostrogothic, Visigothic, Merovingian, Burgundian, and Vandalic, because of: (1) its crude “degenerate” style; (2) its provenance in the Western Empire; (3) its ancestral relationship to later barbarian issues bearing the names or monograms of barbarian kings; (4) the pagan nature of its reverse type; (5) the alteration of its legends and (6) the poorness of its standard weight. These coins are not Byzantine imitations as they often have been erroneously classified. They are distinct issues whose consistent reverse type implies a conscious policy to separate them from the actual Byzantine tremissis. The large quantities extant and the long unbroken history of these coins from the time of Anastasius to that of Justin II, as well as the relatively good quality of their gold and weight standardization, indicate a product determined by a government-directed numis-

<sup>1</sup> Vermeule, *Victoria*. This excellent article cannot be ignored in a study of the development of the representation of the personification Victoria. Mr. Vermeule's distinction between running and walking figures, however, has not been applied in this study. My major concern has been in the attributes which Victoria carries. In regard to stance, I have found it only necessary to distinguish “advancing” figures from standing figures.

matic policy. If this observation is correct, we are confronted with several possible answers to the VPW attribution problem. These coins are either the product of one state or of different states. If the latter assumption is correct, they must have been originated by one state and copied by the others.

The extant VGC tremisses have been attributed for the most part to the Imperial mint at Constantinople and the Ostrogothic mints at Rome and Ravenna.<sup>2</sup> A number of others, of a decidedly cruder style, have been assigned to the mints of the Merovingians and the Burgundians.<sup>3</sup> While the anonymous western mints are responsible for striking both the VPW and the VGC types, the mints of the Eastern Empire mint the VGC exclusively. It is correct therefore to refer only to the western and barbarian issues of the VGC tremissis as Byzantine imitations. Are the diverse policies of eastern and western mints significant? Only an investigation of the antecedents of these tremisses and of the incidence of the VPW type in the East and the West may amplify and clarify the VPW attribution problem. Does the striking of a distinctive VPW in the West as well as an imitative VGC corroborate the observation that one western mint may be responsible for striking the VPW?

The standard type for the tremissis in the early fifth century in both eastern and western halves of the Empire is the predominant VGC type (See Chart I).<sup>4</sup> After the first quarter of the century, however, the cross encircled by a wreath, or the less common chrismon encircled by a wreath, becomes the prevalent type in the West. In the East, the VGC continues to dominate the issues except for those in the name of the empresses, on which the cross-in-wreath is used exclusively. The VPW is not recorded, to my knowledge, as ever having been used on a tremissis from Constantinople in the fifth century. This situation is equally true for the West with one exception,

<sup>2</sup> *BMCVOL*, pp. 47-48, 56. The large number of VGC coins struck by the Ostrogoths in the name of Justinian may be particularly noted in the catalogue of Tolstoï.

<sup>3</sup> For the study of Merovingian and Burgundian coinage see Belfort; Prou; Reinhart, *Merowinger*; Robert, *Languedoc*; Tolstoï.

<sup>4</sup> The statistics for Charts I-VI have been compiled from the following sources: *BMCB*, *BMCRE*, *BMCVOL*, Cohen, *LRBC*, *RIC I-IX*, Sabatier, Tolstoï and Ulrich-Bansa.

a tremissis of the usurper John (423–425). This is recorded by Cohen with the mint mark of RX, which he considers an error on the part of Banduri from whom he is taking this specimen.<sup>5</sup> But from Valentinian III to the end of the reign of Romulus Augustus, the western issues are distinguished from those of the East by the use of the cross-in-wreath type. This situation continues until the reign of Anastasius when the West begins to strike two types, a VGC in imitation of the Imperial issue, and a VPW which continues the separate and distinct character of the fifth century cross-in-wreath issue.

The predominant tremissis type of the fifth century in the East continues there as a mint tradition into the sixth century. In the West, however, both a VPW and a VGC have been substituted for the customary fifth century cross or chrismon-in-wreath type. Both issues in the West are very significant, since neither has appeared on a western tremissis since the early part of the fifth century. If the unique VPW tremissis of John is discounted, the appearance of a VPW on a tremissis is last seen on the small issues of Arcadius. The more recent appearance of the VGC was with the tremisses of Valentinian III, but as a type it was rarely used in the West. Its use is similarly limited to the small issues of Honorius and Arcadius. On the other hand, the VPW had been the favored type in the West in the late fourth century. Consequently, the VPW and the VGC are reintroduced on the Anastasius tremisses in the West. The VGC issue is the result of a fiscal policy which accedes to the Byzantine Emperor the theoretical sovereignty of both halves of the Empire, while the VPW assumes the position held formerly by the cross-in-wreath type, the independent and separate nature of the West.

The cross-in-wreath has been dropped for a symbol of an older tradition. If the later investigation of type significance has any validity, it should not be surprising that in the fifth century both VGC and VPW types were rarely used in the West, or that the VGC in the East was never placed on a coin issued in the name of an empress.<sup>6</sup> The more appropriate non-militaristic cross-in-wreath

<sup>5</sup> Cohen, VIII, p. 208, 7. The mint mark most probably should read RV.

<sup>6</sup> There is only one recorded VPW item on which the name of a Roman empress appears, an Æ 4 from Rome, but it is combined with the name of the emperor (Valentinian III and Placidia). This is recorded in *LRCB*.

without a legend is preferred for the tremisses in either of these categories. The Victory figure, either Christian (VGC) or pagan (VPW) with her traditional legend of VICTORIA AUGUSTORUM would have been inappropriate and too unrealistic for propaganda usage.

The fifth century situation, however, should not lead us to think that the VPW is a new type for the tremissis. Even the unique example of the usurper John would discredit this. If we trace back to the earliest tremissis issue (383–387), we find that Theodosius I issued this coin with both the VGC and the VPW types. As indicated in Chart II, the tremissis was minted exclusively with the VPW at Trier (383–395), Lyon (383–392) and Aquileia (383–388).<sup>7</sup> The mint at Milan (383–395) struck both types, and the mint at Constantinople (383–388) issued only the VGC.<sup>8</sup>

The analysis of the first issues of the tremisses is not complete without considering the possible dependence upon the last issues of the  $1\frac{1}{2}$  gold scripulum piece (1.70 gms.), their immediate predecessor (See Chart II). This coin was struck with a variety of reverse types and legends under Constantine the Great, but after 337, its reverse types become less varied. By 364, two types dominate the series, the seated Victory writing the votive inscription on a shield, and the VPW. At the mints of Trier (367–378), Milan (378–383), Aquileia (378–383) and Rome (364–367) the VPW is used exclusively. It is used at Thessalonica in 364, and at Constantinople (364–367), but is replaced by the votive shield Victory type at Constantinople (367–388) and at Thessalonica (364–375). At Antioch (364–375) the votive Victory had always been used without exception.

In the East, the tremissis descendants of the  $1\frac{1}{2}$  scripulum are never issued as a VPW or as a Victory with votive shield, both types being rejected for the more desirable Christian VGC, or the equally Christian cross or chrismon-in-wreath. In the West, therefore, a more continuous tradition is maintained. At Trier the VPW tremissis series (383–395) replaces the VPW  $1\frac{1}{2}$  scripulum issues which ceased in 378. The same is true for Aquileia where the VPW tremissis of 383 replaces a VPW  $1\frac{1}{2}$  scripulum of 378–383. Milan

<sup>7</sup> *RIC IX*, pp. 28 ff., 51 ff.

<sup>8</sup> *Ibid.*, pp. 78 ff., 232 ff.

continues the VPW tradition in its tremisses but also strikes the VGC type. Rome does not issue a  $1\frac{1}{2}$  scripulum and does not issue a tremissis until after 395, and then only of the VGC and cross or chrismon-in-wreath types.

Although the VPW reverse for the  $1\frac{1}{2}$  scripulum and the early tremisses is a consistent tradition towards the end of the fourth century in the West, extant specimens indicate that it is dropped around the turn of the century. It would seem that with the defeat of Eugenius and the accession of Honorius in the West (395), the VPW is replaced by the VGC. Only three VPW tremisses are recorded after 392, one for Arcadius from Trier, a mint which would seem statistically loyal to the VPW type; another for Eugenius from Trier; and the later issue of John from Ravenna (?).<sup>9</sup> We can assume then that the VPW tremissis type is either dropped or issued rarely, since the above three issues are either very rare or unique. But it would seem evident, that if issued at all it would be in the West. The VPW was never issued on a tremissis from an eastern mint, nor for that matter was it ever a popular type for other eastern issues in gold, silver or bronze (See Charts I and II).

The VPW Anastasius tremissis consequently is a coin issue for which an older reverse type has been revived after an absence of almost a century. The large number of Anastasius VPW tremisses extant could not indicate, on the basis of our study, simply a larger issue of a continuing mint product or tradition. The significance of this revival and its particularly non-eastern origin and character is a most important clue by which the minter of these coins may be revealed.

An analysis of the use of the VPW type throughout the Empire from the late fourth century to the sixth will substantiate a theory of eastern antipathy or indifference to the type. Such an analysis may also further assist attempts to find a more coeval prototype for the Anastasius tremisses than the late fourth century tremissis.

A study of Chart III will quickly show that the VPW is not to be found on any gold coin in the fifth century, East or West. This makes the gold tremissis of John unique. Its rare use on a semis in the late fourth is dropped when, from Valentinian II on, the Victory

<sup>9</sup> *RIC IX*, p. 33, no. 103.

with the votive shield becomes the major semis type for the next century in both the East and the West.<sup>10</sup>

It is on the siliqua and half-siliqua that the type is noted frequently in the late fourth century and on a few specimens of the fifth century (See Chart III). It is to be noted that in the late fourth century it is the only type used on the half-siliqua pieces which Pearce considered so rare that he doubted their forming part of the regular coinage. It may be of significance that the VPW type is used exclusively on this coin, which may have been struck only as a presentation piece for distribution among certain classes of the population on festive occasions.<sup>11</sup> The only issue in the West in the fifth century is again a singular coin of John,<sup>12</sup> while in the East, in the name of Eudocia, wife of Theodosius II, three examples are found, one bearing as might be expected a cross-in-wreath and the other two the chrismon-in-wreath.<sup>13</sup> Tolstoï also catalogued one of the cross-in-wreath type in the name of Pulcheria, wife of Marcian.<sup>14</sup>

On the siliqua, the VPW enjoys a long usage, particularly at Trier and Aquileia, but is non-existent in the East with the exception of one coin in the name of Arcadius listed by Sabatier.<sup>15</sup> Three of the four examples from the West in the fifth century are from Rome. The three coins listed by Sabatier, one of Zeno and two of Anastasius, if of eastern origin would be unique, considering the eastern antipathy to the VPW type. These would seem therefore to be the products of western mints or of Rome in particular.<sup>16</sup> The VPW type on the siliqua is a continuing tradition and its use is even contemporary with the use of the type on the Anastasius tremissis. This is interesting to note since the siliqua is closest in size to the tremissis and maintains a similar position in the silver currency to that of the

<sup>10</sup> After Valentinian III in the West, the cross or chrismon-in-wreath becomes the major type. This is also seen on some imperial issues from the East. See Cohen, VIII, pp. 220ff.

<sup>11</sup> Pearce, *NC 1943*, pp. 97-99.

<sup>12</sup> Cohen, VIII, p. 208, no. 3.

<sup>13</sup> Sabatier, I, p. 120, nos. 4, 5; p. 122, no. 11. Also see Tolstoï, I, p. 86, no. 100.

<sup>14</sup> Tolstoï, I, p. 107, no. 47.

<sup>15</sup> Sabatier, I, p. 104, no. 26. This item is not listed by Pearce in *RIC IX*.

<sup>16</sup> Sabatier, I, p. 140, no. 15; p. 153, no. 9; p. 154, no. 12. Also see *BMC VOL*, p. 44, n. 1. This illustrates a tradition in the time of Odovacar which imitates types suggested by imperial coins already struck in Italy in the name of Zeno.

tremissis in gold. If the silver siliqua is not the prototype for our VPW tremissis, it did help to keep alive the type tradition. The siliqua legend, VICTORIA AVGGG, might also suggest further links with the VPW tremisses, since it will be found on barbarian tremisses in the sixth century.<sup>17</sup>

A slightly different situation presents itself at first when the bronze issues are studied, although the pattern immediately reverts to type developments already noted in the gold and silver issues (See Chart IV). Throughout the Mediterranean the VPW type is not used on either the Æ 1 or Æ 2 series, but it is one of the types used on the Æ 3 during the reigns of Valens, Valentinian I and Gratian at every mint striking bronze. This immediately changes after the accession of Theodosius from which time the East unanimously drops the VPW, never to use it in bronze again. In the West it passes naturally into the Æ 4 issues and as such is found on a coin of Romulus Augustus.

When all of the mints in the East do use this type, however, it is limited to one legend, SECURITAS REIPUBLICAE, and this consistency has all the aspects of a general imperial monetary edict (See Chart V). In the West, however, in all mints except Arles, it appears also with other legends, such as GLORIA ROMANORUM, VICTORIA AVGGG, VICTORIA DD NN AVG, and FELICITAS ROMANORUM. All such specimens, however, are rare. Trier seems to favor the type, for it is the only mint which issues it in combination with the legend GLORIA ROMANORUM at the same time as it strikes the standard GLORIA ROMANORUM issue being minted in the rest of the Empire. Only in the West is this VICTORIA AVGGG legend used on the Æ 3 issues of any type. It is this legend in combination with the VPW that is found on western issues of the Æ 4 struck at all mints down to Romulus Augustus.<sup>18</sup>

There are limitations, therefore even when the East issues the VPW type. Pearce's analysis of the SECURITAS ROMANORUM issue

<sup>17</sup> Such coins can be found in my style groups JAN 11, JAN 11a, JAN 11b, e.g., nos. 396-398, 401-402, 406.

<sup>18</sup> The use of the type, although of an unusual frontal kind, is noted on a unique Zeno Æ 3 VICTORIA AVGGG, however, with the mint mark of Ravenna in the exergue and what may be a rough rendition of the letters SC in the field. These have been listed but not commented on by Sabatier and Tolstoï. Cf. Sabatier, I, p. 141, no. 17, pl. VIII, 7; Tolstoï, I, p. 159, no. 69.



in the East is most illuminating in this regard. Every strong emperor in accordance with the precedent set by Octavian Augustus maintained control of the "Aes coinage, issuing it by virtue of his 'tribunicia potestas' through the agency of the Senate."<sup>19</sup> Valentinian's chancellery controlled the bronze coinage and desired uniformity in order to symbolize the unity of the two parts of the Empire and the dominance of Rome. Since reverse types and legends were rigidly controlled by the chancellery as long as it was able to enforce them, the VPW appears on the Æ 3 issues throughout the Empire.<sup>20</sup> Pearce attributed to eastern passive resistance their reduced minting in the East after Gratian's accession (367) until that of Theodosius (379). That this type then became symbolic of Rome or at least identified with the Emperor in the West may be seen in the discontinuance of the type on the Æ 3 issues in the East in 379, under Theodosius, who by so doing may have subtly asserted eastern equality.<sup>21</sup> It is a coincidence in the light of later history of the type that this numismatic propagandizing occurs concomitantly with the settling of the first Visigoths within the Empire.

The significant striking of the VPW type (Æ 3) in the East with a degree of universal infrequency further supports the hypothesis that it is either unpopular or considered inappropriate in the East. Further evidence for this hypothesis can be found by recording the incidence of the VPW type from the Principate of Augustus to Flavius Victor (See Chart VI). It is only during the reign of Valentinian I that the VPW is issued frequently in the East, and as such it is unprecedented and unique.

Consequently, as in silver, the bronze issues with even greater frequency extend the life of one of the oldest pagan symbols of the Empire. They are not the only vehicles, however, which bridge the gap of the fifth century. There are three other items which bring our type into the world of Anastasius: the *Invicta Roma* bronzes of Theodoric, a gold medallion of Anastasius and a gold medallion of Theodoric. The *Invicta Roma* series attributed to Theodoric (ca. 493) may very well present the clue to the originator and first minter

<sup>19</sup> *RIC IX*, pp. xv-xvi.

<sup>20</sup> *RIC IX*, pp. xviii, xxxiv.

<sup>21</sup> *Ibid.*, pp. xix, xxxi.

of the VPW Anastasius tremissis. These so-called quasi-autonomous bronzes of Rome are all non-Christian oriented in the selection of types and reveal the religious conservatism of the Roman Senatorial class. These coins also do not bear the name of any emperor, only the *Invicta Roma* legend and the bust of Roma on the obverse. When they are compared to those earlier bronzes bearing the name and head of Zeno on the obverse and a Victory on the reverse with the *Invicta Roma* legend, there is a difference in Victory types. The Zeno Roman pieces present an advancing wreath and trophy-bearing Victoria, which on the Theodoric issue has been replaced by a VPW standing on a prow before a lighted altar.

In the quasi-autonomous bronzes assigned to the reigns of Theodoric and Athalaric (494–534), distinctly Roman and pagan emblems are used for reverse types—an eagle, two eagles beneath and beside a fig tree and the wolf suckling the twins. The Roman Senate logically would hesitate to place Anastasius' name on their bronzes, since Theodoric, at the beginning of his reign, is not recognized by the emperor. The substitution of types on both obverse and reverse faces, and the nature of those types, in the time of Anastasius and Theodoric, may provide further clues in the solution of the problem of determining who is responsible for the Anastasius VPW tremissis.<sup>22</sup>

Equally important are the two gold medallions. The VPW type has been recorded on bronze medallions from western mints during the late fourth century (See Chart IV), but its appearance on two unique and coeval gold medallions possibly may be significant. This type may have come to be regarded as appropriate to this denomination. The gold medallion of Anastasius, besides its VPW on the reverse, does have a star in the left field and a chrismon in the right field. Although there are sixth century tremisses extant with a star in the reverse field, there are none known to me with a chrismon. The legends on the medallion are similar to those found on the tremissis: DNANASTASIVS PP AVG; VICTORIA AVGVSTORVM. The similarity ends here, however, for the VPW type on the Anastasius medallion is of diverse tradition from that of the tremissis VPW.

<sup>22</sup> *BMCVOL*, p. 99, pl. XII, 20–23; pl. XIII, 1. Tolstoi agrees with the Wroth attribution. Cf., Tolstoi, I, pp. 158–159, no. 68.

Here a VPW in three-quarter pose and profile head marches to the left in the same manner as seen on the silver siliqua of Arcadius.<sup>23</sup>

The magnificent Theodoric three-solidi gold medallion that unquestionably was a commemorative issue or presentation piece by nature of its size, has considerable bearing upon our problem. It is an extremely fine and unique piece with a frontal bust of Theodoric on the obverse and on the reverse a Victory in girdled chiton standing right on a globe, holding a wreath in her hand and a palm branch on her left shoulder. The VPW design is similar to that found on some of the Anastasius tremisses. The *globus nicephorus* held by Theodoric is, in accordance with tradition, a VPW.<sup>24</sup> The Roman attribution of this by Wroth is reasonable permitting the selection of the design by Theodoric and any of his advisors, such as Cassiodorus. The type is as appropriate for Theodoric as it is for Rome and the Roman Senate. Speculation concerning the date of and reasons for the striking of these medallions must be left for later discussion.

Although these two medallions may have some meaningful association with regard to like use of type, they are naturally not of similar type style. Theodoric's VPW is in keeping with the most prevalent figuration of the type as found in the West from the fourth century through the sixth century. The form of Anastasius' VPW must be a less popular variation in accordance with extant examples. Its dissimilarities with the VPW of the Theodoric Medallion and the VPW of the western sixth century tremisses, suggest different prototype and tradition. It may be possible to suggest further that the singular use of this type on a coin struck in Constantinople, even though more expected on a medallion, indicates that it was somehow commemorative of an event or of persons involved in the international relations of East and West. Considering Theodoric's governmental policy, it might therefore be the justification as well as the model for his medallion.

Our study of type incidence and antecedents and possible prototypes for the Anastasius VPW tremissis has revealed several significant facts. The VPW type is more likely to be issued in the West than in the East. The VPW type is never found in the East and rarely found in the West in the fifth century. The nearest issue in

<sup>23</sup> Ratto, nos. 18-19.

<sup>24</sup> *BMCVOL*, p. 54. Also see Kraus, p. 82, no. 1.

time to the VPW tremissis is in the name of John (423–425). The use of the type can be traced longer in silver down to Zeno and Anastasius in what are most probably western issues. In bronze the use of the type does continue and is minted coevally with the gold coins in question. The eastern mints definitely substitute other types for the VPW used in the West. The only contemporary use of the type in gold besides the tremissis is on the two gold medallions. Finally silver and bronze issues of the type with the names of the Emperors Zeno and Anastasius are attributable to Italian mints.

We may conclude: (1) that the VPW Anastasius tremissis is an example of a new coin issue using a definitely revived reverse type, since its use on any coin and in any metal has been sporadic and rare for almost a century; (2) that the initiative for the striking of these coins is unquestionably conceded to the West; (3) that any of the western mints could have issued the coins if the workshops maintained a file of old die designs for reference;<sup>25</sup> (4) that the striking of a distinguishable non-imperial coin in the name of the emperor could suggest that the minter officially or publicly acknowledged his allegiance to Anastasius thereby indicating a treaty relationship; (5) that the minter is not compromised as is the minter in the East by the pagan connotations of the traditional VPW, which immediately calls to mind the long-dying pagan preferences of such cities as Rome and Arles;<sup>26</sup> (6) that discounting the religious issue the incidence patterns of the type might indicate a particular iconographical relationship between the VPW and the Western Empire or Rome understood by both the minter and the users of the coin; (7) that Theodoric may have some connection with the issue since he is already associated with a contemporary use of the type; and (8) that the western numismatic tradition responsible for the VPW Anastasius tremisses may have been already in operation with the striking of the VPW type in the names of late emperors such as Zeno and Anastasius, since the silver and bronze issues in their names seem unquestionably attributable to Italian mints.

<sup>25</sup> Grant, *Anniversary Issues*, p. 155. Also see Vermeule, *Ancient Dies*, p. 356.

<sup>26</sup> Sidonius Apollinaris, I, pp. lxiv, cxii, cxxi; II, pp. 26–31, Bk. I, letter xi. Also see Maurice II, p. 141. As an indication of the continuing presence of paganism see the *Cod. Theod.* L. 25, 31 which has been quoted by Sabatier, I, p. 112, n. 1.

## THE SIGNIFICANCE OF THE VPW TYPE AND ITS USE ON THE ANASTASIUS TREMISSIS IN THE WEST

The incidence data compiled provide a basis for an iconographical investigation of the VPW type. The almost total disregard of the VPW in the East and its substitution by the VGC type; the diminishing use of the type in the West; the earlier conscious preference for the type during the reigns of Vespasian and Valentinian I; and the evidence of its being revived on the tremissis of Anastasius combine to suggest the use of the VPW as an intelligible symbol. The political use of numismatic types in Roman coins is common knowledge. Does the revival of a type discarded for a century on the tremissis serve the purpose of political propaganda? If it does, then it must be proved that the Victoria in conjunction with palm and wreath has a particular symbolic nature accepted by a central authority as being intelligible to the masses. Or, at the least, that the VPW is more applicable to the necessities of contemporary politics than any of the other Victory types in use: the VGC (being used in the East), the Victory with wreath and trophy as seen on the quasi-autonomous bronzes of Zeno-Odoacar, and the Brescian Victoria. Or, that the VPW symbol has an integrity of its own. However fruitful such an investigation might be and however beautiful the intricate structure of interrelating hypotheses, we cannot discount the possibility that the selection of the type may depend solely on its intimate traditional usage on Roman Imperial coins. Was it selected simply by force of habit by mints and minters who previously had a long history of use of the type and had continued to use it on small issues of silver and bronze? Was it simply the need for selecting a type distinctive from that used in Constantinople, regardless of symbolic connotation and political propaganda? Would it be so unusual for these mints which struck the type so frequently in the past to copy a type for which old die designs were possibly available?

Even a perusal of the history of Roman numismatic types will

demonstrate that there was no personification, no minor deity more popular, more ever present, more imperially associated than the goddess Victoria.<sup>1</sup> She appears in many guises, with many attributes, with many specific connotations throughout the life of the Republic and the Empire. It is unnecessary to refer to her constant appearance on medallions, cameos, intaglios, sculptural reliefs, in paintings and in sculpture in the round, as well as on coins. She appears on gems as early as the late Etruscan period and is still found as late as the sixth century on consular diptychs.<sup>2</sup> This is indicative of the major rôle she plays in Imperial ideology, a rôle succinctly described by Graillot: "C'est la Victoire qui a fondé l'Empire; c'est par elle qu'il se perpétue."<sup>3</sup>

A cursory review of the numismatic use of the VPW type will help our inquiries. The earliest numismatic association of Victoria with palm and wreath is to be found on a silver didrachm from Southern Italy dating between 241–222 B.C., on which Victoria holds a palm branch to which she attaches a wreath crown.<sup>4</sup> This may be in consequence of the tradition established ca. 293 B.C., when both the wreath and the palm of Greek tradition were awarded to the victors in games, and Victoria is alluded to as the *palmaris dea*.<sup>5</sup> Much more significant is the frequent use of the VPW on the "Victoriatius." Although the Victory on the Republican quinarius may often bear only a wreath with which to crown the trophy erected in front of her, she often bears a palm branch against a shoulder if she is to carry anything in the free hand.<sup>6</sup> Her first recorded solo appearance,

<sup>1</sup> See the Synoptic Table of Allegorical Personifications in Gneecchi, *Coin Types*, pp. 29–35, 63. Also see Vermeule, *Victoria*.

<sup>2</sup> Numerous references could illustrate this: Walters, *Engraved Gems and Cameos*, nos. 712, 1170, 1705–1709, 1717, 1718, 2228, 3058, 3059, 3789 and 3911; Gneecchi, *Coin Types*, pl. V; Delbrueck, *Consulardiptychen*, Lief I, no. 1 and Lief IV, no. 48; *BMCRE*, I, pp. 113, 122, 128, 146, 154, 202, and nos. 526, 551, 552, 560, 564, 641, 657, 770, and 855.

<sup>3</sup> Daremberg-Saglio, V, p. 839. This is H. Graillot's article on "Victoria." There is also an excellent discussion in Gagé, *RA* 1930, pp. 1–3.

<sup>4</sup> *CCR*, pp. 2–3, nos. 21 and 21A.

<sup>5</sup> Daremberg-Saglio, V, p. 852. Also see Livy, X, 47, 3; Apuleius Madaurensis, *Metamorphoseon*, II, 4. Statues of the VPW were to be found decorating the Spina in the Circus Maximus at Rome and at various Provincial Circuses, see Daremberg-Saglio, I, figs. 1518, 1520, 1521, and 1524–1526.

<sup>6</sup> *CCR*, p. 8, nos. 83–84, and pp. 11–12, nos. 111–121; also *BMCR*, I, p. 277, nos. 2138ff.

however, is on a silver quinarius of the Marianist, L. Calpurnius Piso in 90 B.C.<sup>7</sup>

The numismatic frequency of Victoria is accounted for by the developing importance of her personification through the territorial expansion of Rome. The Temple of Iovis Victoria, the first recorded, was dedicated on the Palatine in 294 B.C., while a century later the Aedicola of Victoria Virgo (193 B.C.) was also founded there.<sup>8</sup> The quinarius of Calpurnius Piso might very well commemorate these two dedications as well as the Marian cause he represents, since quinarii are so very frequently attributable to special commemorative celebrations.<sup>9</sup>

As might be expected it is in the last century of the Republic that the reference to Victoria on the coins becomes the most popular. It is at this time that she assumes so many attributes and her depictions are so varied. Her cult, still amorphous in ritual and still lacking independent deification status, is adopted by Marius, Sulla, Pompey, Caesar, Marc Antony and Octavian. We are told that Marius placed his statue between two gold VPW's on the Capitoline and that his figure removed by Sulla was replaced by Caesar in 65 B.C.<sup>10</sup> This statue before the Temple of Victory is to be seen on the coins of the leading Marian, C. Marcus Censorinus.<sup>11</sup> Marius, if not the first to make the association, certainly revitalized or emphasized the connection of the goddess with the army. Her commemoration of military victories is always noted on the coins of moneyers of the family of Scipio and of M. Cato,<sup>12</sup> but the Marius association is of primary importance for her future. Caesar's allegiance to Marius, and Octavian's to Caesar, is the germinating flux necessary for

<sup>7</sup> *CCR*, pp. 102-103, nos. 672a-672h (listed as common), nos. 673a, 673b (scarce) and no. 674 (scarce).

<sup>8</sup> See Livy, X, 29, 14; X, 33, 9; XXIX, 14, 14; XXXV, 9, 6; and Ovid, *Fasti*, VI, 644.

<sup>9</sup> Grant, *RIM*, p. 206.

<sup>10</sup> Plutarch, *Caesar*, 6, 1; Velleius Paterculus, II, 43, 4; Valerius Maximus, VI, 6, 14; Suetonius, *Caesar*, 11; *PW*, Series 2, VIII, A, pt. 2, p. 2513.

<sup>11</sup> *CCR*, pp. 111-112. The existence of a Temple of Victory on the Palatine as early as 204 B.C. is implied by a reference in Livy concerning the transference of a sacred meteorite stone of the Mater Magna to it. Livy, XXIX, 14, 3 "... in aedam Victoria quae est in Palatio."

<sup>12</sup> *CCR*, pp. 83, 175 ff.

transforming "Victoria" into her prime rôle at the core of Imperial theology.

Her frequency as a solo VPW increases in denarius and quinarius issues from 44 B.C. The personification so identified with Caesar who founded Temples of Hercules Invictus, Minerva Victrix, Venus Victrix and one at Pharsalos where he fought in the name of Venus Victrix, is used by Caesar's murderers who present on a coin a VPW with a broken wreath and a broken sceptre at her feet.<sup>13</sup> Marc Antony uses a VPW on a denarius from Asia Minor (31-30 B.C.) and on another from Cyrenaica (31-30 B.C.), but most important is the denarius of Octavian on the reverse of which is a VPW on a globe and the legend CAESAR DIVI F(ilius). The date of this issue is debated as either immediately preceding or following the Battle of Actium (ca. 31-29 B.C.).<sup>14</sup> Equally as important as its connection with the Battle of Actium is the use of a VPW in conjunction with the legend in which Octavian declares himself son of God.<sup>15</sup> The earliest association between Victoria and imperial inheritance is so made in a VPW, an association which contains the seeds of the type's later imperial associations with the legend, "Victoria Augusta."

This coin may also have further significance for us. The VPW on a globe would seem to be a copy of the Victory statue from Tarentum, placed on an altar in the Curia Julia by Augustus on August 28, 29 B.C., when he established the cult of Victory in commemoration of the Battle of Actium. The statue also appears on coins struck in Cyrenaica (30-27 B.C.), Corinth and on a Cistophoric issue.<sup>16</sup> At this altar in the Curia, Augustus prescribed that all Senators burn incense before their deliberations.<sup>17</sup> This tradition was to be maintained to A.D. 382, when Gratian removed the statue. This latter *cause célèbre* proves how even after Constantine, the Roman Senators, pagan-Christian, regarded this statue more as a symbol of State

<sup>13</sup> Ibid., p. 203, no. 1298. Also see *PW*, Series 2, VIII, A, pt. 2, p. 2517.

<sup>14</sup> Grant, *RIM*, p. 13.

<sup>15</sup> Julius Caesar was deified in 42 B.C.

<sup>16</sup> *CCR*, pl. III, 60 (a denarius of L. Pinarius Scarpus). Also see *BMC Corinth*, pl. 15, 10 (coins struck by Duumvirs, Vatronius Labeo and Rutilius Plaucus); Daremberg-Saglio, I, p. 1213, fig. 1563; Mommsen, *Monnaie Romaine*, III, p. 302.

<sup>17</sup> Gagé, *RH* 1933, p. 34; Taylor, pp. 153, 187. The ancient source is Cassius Dio Cocceianus, LI, 22, 1.



rather than just as a symbol of Imperial Victory. It was well worthy of the patriotic devotion of the Senate, since the rites before it symbolized their allegiance and obeisance to the State.

Another coin indicative of the developing imperial rôle of Victoria is an African bronze issue of ca. 25 B.C., of the proconsul, M. Acilius Glabrio. The obverse presents the bare head of Octavian facing an advancing VPW (ancestress of the *globus nicephorus* held in the hands of the Roman emperor) with the legend IMP CAESAR DIVI F AUGUST. COS IX. The reverse presents the heads of Marcellus and Julia facing each other with the name of Glabrio, the minter, on the legend. This coin implies the source of Octavian's "auctoritas" through his current consulship and therefore his imperium in Italy and his own provinces as well as through the Victoria Caesaris and his adoption by Caesar. Grant believes that the placement on the reverse of Julia and Octavian's nephew Marcellus, who were married in 25 B.C., may suggest a possible successor.<sup>18</sup>

The VPW, which has had a traditional connection with military and athletic triumphs (its statues on the Spina in the Circus), is increasing its realm of meanings. The philosophical and morally stoic society had already associated rights and duties with Victory. It was not just "winning."<sup>19</sup> But she now offers guarantees of victory in life, apotheosis in death and victories for all descendants.<sup>20</sup> This new imperial rôle is clearly depicted on a sword of Tiberius in the British Museum. A Victory bearing a shield with the inscription VIC AVG stands behind the enthroned Tiberius, who offers a *globus nicephorus* to Germanicus, thereby signifying the victories which come from Augustus through Tiberius to Germanicus.<sup>21</sup> As Octavian based his rule to some extent on his descent from Divus Julius so

<sup>18</sup> Grant, *RIM*, p. 27.

<sup>19</sup> Ennius, *Annales*, 493v: "*Qui vincit non est victor nisi victus fatetur*;" Livy, IV, 10, 3 and XLIV, 47, 8: "*.....fatentes victos se esse et imperio parere*," "*.....eius demum animum in perpetuum vinci, cui confessit expressa sit se neque arte neque casu, sed collabis comminus viribus, iusto ac pio bello superatum*." Cicero, *Att.*, VII, 22, 1 and IX, 7c, 1; Virgil, *Georgics*, IV, 561; Tacitus, *Germaniae*, 2; Serv. Aem. IV, 618 and I, 6.

<sup>20</sup> Gagé, *RA* 1930, pp. 1-2, 34; Gagé, *RH* 1933, p. 43. M. Gagé draws his conclusions from Cassius Dio Cocceianus, XLV, 17 and XLVIII, 16.

<sup>21</sup> Gagé, *RA* 1930, p. 13; Franks, *Proceedings of the Society of Antiquarians*, London, III (1864-1867), p. 358; Walters, *Select Bronzes*, p. 867.

did all the emperors from Tiberius base their "auctoritas" upon their descent from Divus Augustus through the medium of the cult of Victoria Augusta.

The final stage of the development of the cult of Victoria is attained in the Principate of Octavian, who has incorporated with the new imperial cult all the previous associations of the Venus Victrix et Felicitas of Pergamum worshiped by Sulla and Pompey, and the Victoria Genetrix of Caesar.<sup>22</sup> The Victoria Sullae and the Victoria Caesaris are the prototypes for the Victoria Augusta. Here the stoic philosophical and moral interpretations are combined with political and religious identifications to create a worshipful symbol of the essence of the new world, the Roman Empire. The cult will never lose its personal identification with Augustus, the founder of the Principate and even the cult itself in its wider meaning. Victoria is an heraldic device, a religious and legal symbol of the Empire. It stands for security, freedom, mildness and well-being within the borders of the Empire. It brings peace and prosperity wherever it marches ahead of the Imperial legions, whom it protects and whose right to victory it guarantees.<sup>23</sup> It is Roma.<sup>24</sup>

The Victoria Augusta, always in the care of the Pontifex Maximus who is also the emperor, is inherited by each successive Augustus. In this way the legitimate rule of the Empire is handed down.<sup>25</sup> This accounts for the extensive use of the Victoria on coins of Vespasian who modeled his religious and dynastic program on that of Augustus in his efforts to legitimize the right of his house to the imperial throne. Through her he identifies himself and his house with Augustus and the glories and traditions of the Empire.<sup>26</sup> It is through

<sup>22</sup> A temple of Venus Victrix was consecrated at Rome in 55 B.C. See Gagé, *RA* 1930, p. 34.

<sup>23</sup> Gagé, *RA* 1930, pp. 2-4; Deubner, pp. 37-42; Scott, *Flavians*, p. 26; *PW*, Series 2, VIII, A, pt. 2, pp. 2509, 2510, 2520. It is stated in the latter reference that the Victoria Augusta implied the complex political and social service of Rome to all of its subjects, the VICTORIA UTI, so called by Caesar and known also as the *Victoria Caesaris* and *Clementia Caesaris*.

<sup>24</sup> Victory types are one of the major personifications seen on third century medallions, and Roma is shown holding a *globus nicephorus*. See Toynbee, *JRS* 1947, pp. 135-144.

<sup>25</sup> Gagé, *RH* 1933, p. 13; Scott, *Flavians*, p. 25; *PW*, Series 2, VIII, A, pt. 2, p. 2511.

<sup>26</sup> Scott, *Flavians*, pp. 28-29.

Victoria that the aegis of Roma Aeterna is passed down to the future. This concept is materialized on the reverse of a bronze issue of A.D. 71, on which a flying Victory bearing a palm presents the palladium, the symbol of the eternity and security of Rome, to Vespasian.<sup>27</sup>

Even more indicative for us is a denarius of A.D. 70–71, which commemorates Vespasian's victories over both internal anarchy and his external enemies. The reverse depicts a VPW on a prow about which Grant presents an interesting hypothesis. Vespasian, as a conqueror of the East and as a restorer of the Republic, is identified with Augustus whom he in turn complements as a true successor of Alexander in the Hellenic non-autocratic tradition of government. A century after the Battle of Actium this coin may interpret that event in a larger historical connexion. Demetrius Poliorcetes (363–283 B.C.) placed the same type on a coin in 306 B.C., to celebrate his victories during the wars following the death of Alexander. In a naval victory off Cyprus, Demetrius had defeated Ptolemy. Thus the King of Pergamum, son of the ruler of Macedonia, is the westernmost ruler and his dynasty the most western which defeats the East, Egypt. Furthermore, one of Demetrius' successors, Antigonus Gonatus (ca. 276–239 B.C.) conceived with the advice of Stoics a theory of monarchy as a kind of "admired slavery," and this was recognized at the time as a contribution to the philosophy of the Principate. Thus Alexander, Demetrius, Augustus and Vespasian all represent the West and the non-autocratic Hellenic tradition in their victory over the East. This was the part played certainly by Octavian at Actium in defeating Antony and Cleopatra. Although the navy was not too involved with Vespasian's victory he retains the figure of the Victory on a prow.<sup>28</sup>

This Pergamenian association of VPW may be accounted for by other evidence: the possibility that Octavian's denarius discussed above was minted in 29 B.C. in the East from the proceeds of Egyptian spoils, since he spent some time there reorganizing affairs; that

<sup>27</sup> Scott, *Flavians*, pp. 24–25; Kähler, *Personificationem*, pp. 31–32; *BMCRE*, II, p. 126, no. 586.

<sup>28</sup> Grant, *RIM*, pp. 188–189. Grant relates Tacitus' comments concerning the plans of Vespasian to invade Africa by land and sea.

the cult of Venus Victrix et Felicitas has Pergamum origins; that Demetrius' use of a VPW may be fully in accordance with Pergamian iconology, because a Nike with palm and wreath crowns Athena on the east frieze of the Altar of Zeus and more winged Nikes aid the gods and goddesses on the north frieze.<sup>29</sup>

Of major importance to the Late Empire is the rôle that the goddess Victoria and her representation with palm and wreath plays in the time of Constantine the Great. The VPW type is, on the basis of its frequency of occurrence, a decorative and symbolic device in Constantinian workshops. The type is formularized and imitated on architectural decoration ranging from good to commercially produced pieces. Examples may be found on some consoles from the Maxentius Basilica and the Casa di Rienzo.<sup>30</sup> All of these date between A.D. 310–315.

The VPW type as depicted on the Arch of Constantine reveals its rôle in the early fourth century. In the Proelium Frieze she leads the emperor into battle; in the Ingressus she shares the emperor's triumph, striding beside his chariot; in the Praefactio she appears on top of a standard as a Dea Militaris. In other Constantinian reliefs on the Arch (the keystone of the main portal of the north side), she appears as a *globus nicephorus* held in the right hand of the enthroned Roma Aeterna. In both the western and eastern passages she is seen crowning male busts. She therefore is depicted in accordance with the representation in earlier reliefs on the Arch. In the second century Attic reliefs she appears twice on a military standard as a Dea Militaris, and on the Trajanic relief on the east wall of the main passage she crowns the emperor. It is however on the pedestal reliefs where Constantine is represented as "ubique victor," "victoriosus semper" and "victor omnium gentium" that the significance of the VPW may be inferred.

There are twenty-four of these reliefs; twelve to each of the north and south sides of the Arch; three to each of the four pedestals which support the four columns on each of the north and south faces

<sup>29</sup> Kähler, *Pergamon*, pls. 3, 13, 25. In thus presenting the Nike, Pergamum, a major cultural and religious Hellenistic center, may have been equally important in giving impetus and prototypes for Roman forms as it was generally in architecture and sculpture.

<sup>30</sup> Kähler, *JDAI* 1936, pp. 185–186, 193.

of the Arch. Of these twenty-four reliefs, eight are the more significant not only because of the visual advantage of their physical position, but also because of the symbolic pattern they form as a unit. These are the reliefs on the front face of each of the eight pedestals. On the north side, the frontal faces of the outside pedestals depict a standing VPW with a kneeling northern captive, while the frontal faces of the inside pedestals depict a Victory with a Votive Shield and a kneeling Northerner. The side faces also fit a symmetrical pattern in which pairs complement each other in content but do not exactly duplicate each other formally. The side faces of the outside pedestals (those bearing the VPW) depict a northern family with a Trophy on one, and a Roman soldier leading a captive Northerner on the other; the side faces of the inside pedestals depict Roman soldiers with northern captives on one and the Imperial Guard with the statuettes of the *Dei Militaris* on the other. The north side of the Arch in both the pedestal and the frieze reliefs of the *Oratio* and the *Liberalitas* announce the “*victor perpetua*” through the *Vota* festivals as symbolized by the Votive Victory.

On the south side, the frontal faces of the outside pedestals present a standing VPW with a kneeling Oriental on one and a Northerner on the other, while the frontal faces of the inside pedestals depict a Trophy-bearing *Victoria* with captives. The side faces of the outside pedestals parallel those of the north side; on one, an oriental family surrounds a Trophy, and on the other a northern family surrounds a Trophy, and a Roman soldier leads an oriental captive on one and a Northerner on the other. The side faces on the inside pedestals depict Roman soldiers leading captives, and marching “*signiferi*” carrying the Imperial insignia. The south side commemorates through its pedestal and frieze reliefs of the *Obsidio* and the *Proelium* the “*victor omnium gentium*” by representing the physical attainment of the Triumph.<sup>31</sup> The supporting rôle played by the VPW on the pedestal reliefs is that of the continuous background motif — the *Victoria Augusta*. Its presence qualifies and characterizes the “*victor perpetua*” and mitigates the ravages of war. It is the palm and wreath that truly symbolize the more

<sup>31</sup> For a diagram of the numbered friezes see L'Orange, *Konstantinsbogen*, Abb. 16.

enduring peaceful aspects of victory. The fruits of Roman victory for even the subjugated peoples are peace, order and prosperity.<sup>32</sup> The conquered are welcomed into the brotherhood of the Pax Augusta, the real prize of the Victoria Augusta. The VPW appears then as the most generic form for representing the Victoria Augusta.

As one of the Dei Militaris along with Sol Invictus, she also is most important for us, and her constant use with Roma Aeterna as a "victoriola orb" seems to make Victoria and Sol the rulers of the whole religious world of the Constantine building program.<sup>33</sup> From the time of the Tiberius coin previously described in which the VPW first appears as an orb in the hand of the emperor, she is a constant figure as a victoriola in imperial iconology and persists in this rôle even on the Theodoric medallion which presents Theodoric, like Constantine, as "victor omnium gentium." Her depiction with Roma Aeterna on the Arch may be based on the old colossal porphyry cult statue of Roma Aeterna, which was once in a Hadrianic temple dedicated to that goddess and which was in the Temple of Venus and Rome in Constantine's time. Burned down in A.D. 307, it was rebuilt by Maxentius so that the venerable cult image could be housed. That the association of VPW with the goddess may go back even into Republican times is based on the evidence that the east keystone of the Janus Arch in Rome has a similar Roma Aeterna figure. It is significant for us that Theodosius, so instrumental in removing the VPW type from coins in the East, is also responsible for replacing the *globus nicephorus* of Roma Aeterna with a *globus cruciger*.<sup>34</sup> For Theodosius and the Christian Roman Empire the cross is assuming all of the rôles of the VPW.

The survival of Victoria in any form throughout the fifth century is evidence of her importance, and her survival in pure pagan forms with or without associating Christian qualifying marks presents the problem faced by mint masters in the late empire. Her rôle had become so identified with the state that she was beyond the limiting bonds of religions. Besides, the fourth century population, as well

<sup>32</sup> Deubner, pp. 37-42. Nemesis destroys the enemies of the emperor and punishes their insolence, while Victoria brings Pax.

<sup>33</sup> L'Orange, *Konstantinsbogens*, pp. 57-58.

<sup>34</sup> *Ibid.*, p. 149.

as that of the fifth century, was still pagan orientated. We have evidence from both Arles and Rome to indicate that a large part of the aristocracy was still intellectually, emotionally and religiously pagan while being only politically Christian.<sup>35</sup> The silver bowl in Leningrad from the time of Constantinus II presents the dichotomy and incongruity of a VPW leading the way for the imperial equestrian figure, while a soldier keeping up the rear holds a shield decorated with the chrismon.<sup>36</sup> The victory of the emperor is thereby doubly insured.

Pearce's explanation for the Valentinian I control of the GLORIA ROMANORUM and SECURITAS REIPUBLICAE issues furthers our realization of the persisting importance of Victoria and the VPW outside the realm of religions, particularly in the West, and her association by the people of the empire with Rome. As long as the strong emperor was at Rome his chancellery was able to uniform and regularize the striking of the issues in every bronze mint of the two emperors (Valens and Valentinian I). When Gratian succeeds to the purple in A.D. 367, the East can rally only insofar as to curtail the striking of bronze coins of these issues. Once Theodosius ascends to the Eastern throne in A.D. 379, there is a dramatic and immediate change of types, and from that time the VPW is dropped in the East, although it is continued in the West. Yet, it is only here on the bronze coinage that Theodosius asserts eastern independence in the Roman world. Certainly, at this time the VPW must have been equated with Rome and the West.<sup>37</sup>

Constantinople, the capital in the East, truly stands for a new world, a Christian Empire, and as such it more strenuously dissociates itself from all pagan references, or it must Christianize those that it cannot eradicate. Theodosius, certainly, sees his rôle in the East in this framework and with true Spanish latent iconoclastic zeal replaces the *globus nicephorus* with the *globus cruciger*. The new sister capital also needs to establish a separate identity and an iconography of its own, although tradition might have made this

<sup>35</sup> Dill, *Roman Society*, pp. 27-58. This is an excellent discussion of the tenacity of paganism. Also see Alföldi, *ACILRE*, p. 83.

<sup>36</sup> Delbrueck, *Kaiserornat*, pp. 1-21.

<sup>37</sup> *RIC IX*, pp. xviii-xix, xxxi.

impossible if it had not been for the advent of a new state religion, Christianity. When Constantinople needs to effect a symbolic change to assert its own beginning and independence, its excuse is Christianity.

There seems to be no question of the traditional Roman association and that of the Senate with Victoria and with her most generic form, the VPW. It is an association maintained by the vigilance of the Senate and the ritual at the feet of Victoria on the altar in the Curia. It is an association kept alive by the legal descent from Augustus the founder of the Empire and of the cult. Rome is Victoria. Victoria is Rome. It is Augustus who consummated the marriage for the benefits of his own time and for all of his descendants.

It is not surprising considering the significance of the type that it should be revived on coins found in the West and therefore minted in the West even in a more Christian sixth century. The very nature of Victoria being a *Dea Militaris* would establish the worship of the cult wherever the army was stationed or wherever veterans were to be found.<sup>38</sup> For the entire period of the late empire in the West the army is to be found stationed in Gaul and North Italy, as would be indicated by the location of the mints. This would perhaps account for the frequent use of the VPW type particularly at the mint of Trier, and even the unusual striking of a *GLORIA ROMANORUM* issue of Valens and Valentinian I with a VPW type. Altars such as those erected at Lyons in 10 B.C., to the Victoria Augusta with figures of VPW, imitating the altar and cult statue in the Curia Julia, must have been common features in Gaul and other western provinces, since the altar at Lyons was specifically given by Rome. The VPW is a common cult given to Gaul by the Romans. She is also important therefore for the non-military provincials. She represents the official cult through which loyalty to the emperor is expressed. Every town has its altar and statue of Victoria, where public fêtes always take place. The Victoria cult was a means by which local colonial and provincial deities could be transformed into a more Roman framework, e.g., Brigantes, an English goddess who became *Dea Victoria Brigantia*.<sup>39</sup>

<sup>38</sup> Daremberg-Saglio, V, p. 841.

<sup>39</sup> *Ibid.*, p. 842.



Should we not investigate the possibility then that the selection of the VPW type for this Anastasius tremissis is engineered purposely to distinguish it as a western mint product in the name of the only emperor then in the Empire, but at possibly a time when all of the barbarian kingdoms in the West, or the particular minter of this coin, if only one minted it, were allied to Anastasius, and for the sake of diplomatic niceties and legalities owed him allegiance? It must also most likely commemorate a military victory since the type even in its past was used most frequently in conjunction with either contemporary military campaigns and victories or Augustan ones. Whoever mints it must, in accordance with a long tradition, connect himself through the Victoria Augusta with Rome, the Roman Senate and Augustus. It would seem most unlikely that the type was used without understanding its historical and traditional significance. There is too much circumstantial evidence to give credence to the alternate hypothesis that the striking of the type is due to the accidents of necessity, expediency, familiarity and continuity. The extent of the issue in both quantity and time would indicate more satisfactorily a carefully conceived and organized numismatic policy.

## BARBARIANS AND THE VPW TREMISSIS

Since our compilation of evidence, factual and circumstantial, suggests Western origin and responsibility for the striking of the VPW tremissis in the name of Anastasius, it becomes necessary to consider the associations of the various barbarian kingdoms with this coin in order to discover its moneyer. By virtue of provenance and attribution none save the Suevians can be omitted.<sup>1</sup> Tremisses of the VPW type from Anastasius to Justin II have been in part attributed to the Vandals, the Merovingians, the Burgundians, the Ostrogoths and the Visigoths.

Vandalic attributions are the most tenuous to uphold. There is no evidence that the Vandals ever minted in gold. The very few solidi and tremisses attributed to them are done so purely on stylistic grounds which are always very questionable when not supported by external evidence. There is, however, the questionable probability of African provenance for these coins. Those in the British Museum are catalogued as Vandalic because "...the Count de Salis has pronounced (these coins) to be Vandal on grounds of style (and probably of provenance)."<sup>2</sup> Since de Salis did not publish any of his reasons, except for what was verbally passed on to Keary on this matter, the Wroth catalogue attributions may count for very little, particularly when we consider the total aspect of Vandalic coinage. From possibly as early as A.D. 439 to 533, there is a Vandalic tradition for the striking of only silver and bronze. The few gold pieces are anomalies in this fiscal tradition. There are no discernible mint marks on the attributed gold, since the earlier of the two groups are

<sup>1</sup> Reinhart, *Swebenreiches*, pp. 151-191, pls. XXXIII-XXXVI.

<sup>2</sup> *BMCVOL*, p. XVI. Wroth puts forth the judgement of the Comte de Salis as published by Keary, pl. I, nos. 16, 17. This attribution was rejected by Tolstoi, II, p. 212, no. 152, who suggested a Merovingian or Burgundian attribution for these coins rather than a Vandalic. Le Gentilhomme, *RN* 1943, p. 84 does not attribute any gold coinage to the Vandals. The more recent work of Troussel also questions the Wroth attribution (pp. 153, 157) and is of the opinion that the Vandals never minted gold coins (p. 188).

imitations of solidi and tremisses in the name of Valentinian III, and the latter are in the name of Anastasius. Thus if these were minted in Carthage, the early coins were under Gaiseric (428–471), and the Anastasius pieces would coincide with the reigns of Gunthamund (484–496), or Trasamund (496–523), or both. On stylistic grounds, however, the tremisses particularly are extremely close to coins found in greater abundance in southern France and will prove later to be a definite product of Gaul. Friedlaender's early doubting of Vandalic minting of gold might be an accurate hypothesis.<sup>3</sup>

If these eight Anastasius tremisses in the British Museum were minted by the Vandals,<sup>4</sup> their use of the VPW type could only be accounted for by habit and familiarity, since the type is found on a large group of attributed small bronze coins of likely local unofficial issues in North Africa which bear the names of Honorius and Valentinian III. These issues bear the legends: VICTORIA AVGG and SALUS REIPUBLICAE, when both legends are not so crudely blundered as to be illegible, as *INNN* or *AVIII*.<sup>5</sup> All of these may be fifth century products and therefore in accordance with VPW traditions of western bronze issues. The Vandalic attitude towards both Rome and Constantinople and the Empire seems inappropriate to any meaningful use of the VPW type for political or ideological considerations. They always conceive of themselves as separate and autonomous rather than as a part of the Empire. This is reflected in their being the first of the barbarians to place the name of their own king on their coins.<sup>6</sup>

The possible finding of a few VPW gold coins in North Africa should not encourage the rash view of their being local mint products. Strong trade relations existed between Africa and Italy as well as southern France and Spain. Friedlaender, disbelieving their

<sup>3</sup> Friedlaender, *Vandalen*, p. 6. This thesis is accepted by the majority today. Particularly note the discussion of this question in Troussel, p. 188.

<sup>4</sup> *BMCVOL*, pp. 10–11.

<sup>5</sup> *Ibid.*, p. 20. These are attributed as products of the mint at Rome by Carson and Kent, see *LRBC*, p. 63.

<sup>6</sup> Gunthamund (484–496) is the first to do this and he establishes a tradition which extends down to Hilderic who dies in 530. See Friedlaender, *Vandalen*, p. 5. The most useful text for the history of the Vandals is Ludwig Schmidt's, *Geschichte der Wandalen*, 2nd ed., Munich, 1942.

Vandalic attribution, saw them as being possibly Ostrogothic and their African provenance accounted for by the story of the Ostrogoths paying one gold coin for each "Trulle" of grain shipped by the Vandals during a famine in Italy.<sup>7</sup> The stylistic relationship of the gold tremissis to the Vandalic silver and bronze is less similar than to the other gold VPW tremisses that have been attributed to other barbarian mints. It is the bronzes of the Imperial Carthaginian mint after 534, however, that bear a marked resemblance to the developing stylized bust portrait on the coins of particularly Spanish provenance (See PLATE B,7). The Carthaginian portrait bust even at that time presents a pectoral cross or chrismon.<sup>8</sup> Such connections are seen often in both artistic and other cultural and intellectual areas and may point to common mutual developments and reciprocal influences.<sup>9</sup> One should not be surprised to find similarities and connections between cultural products in North Africa and the Iberian Peninsula; one should expect it. This existent factor alone would leave open for consideration numismatic connections between the mint at Carthage and those in Spain, if it was not negated by the preponderance of Imperial Italian and Gallic mint products found in Spain.

The possibility that this tremissis is a product of Vandalic fiscal initiation is further obstructed by too many qualifying hypotheses. Their rulers never could have espoused the rôle of "Restitutor orbis Romanum" unless sardonically.<sup>10</sup> Nor does it seem possible that other barbarians would imitate Vandalic numismatic measures or that the Carthaginian mint would set an example for those in Gaul. It would seem an extraordinary eventuality, and there is no evidence to warrant the consideration of this as feasible. Furthermore, Gunthamund and Trasamund did not play any significant rôle in the affairs of Gaul and Spain to warrant any connection on their part with the Anastasius tremisses. If the Vandals minted this tremissis, therefore, it must have been in imitation of a fiscal measure already adopted at more important mints in the West such as those in Gaul or Italy.

<sup>7</sup> Friedlaender, *Vandalen*, p. 6. Friedlaender quotes from Olympiodori, *Corpus Scriptorum Hist. Byz.*, pars I (Bonne, 1829), p. 46.

<sup>8</sup> *BMCB*, I, p. IX, nos. 15-17.

<sup>9</sup> Schlunk, *Visigodo*, pp. 227, 235.

<sup>10</sup> Halphen, pp. 38-40.

The connections of the other barbarian kingdoms are much stronger since all occupied at some time the vicinity in which these coins must originate, southern France. The major French collections based largely on French hoard finds contain the largest number of the VPW tremisses for the Anastasius period, and their collections diminish in the number of these coins for each successive emperor, (See Charts VII and IX). Spanish collections on the other hand tend to develop in the opposite direction, with the Anastasius pieces being the smallest in number.<sup>11</sup> This is only one observation among many which gives increasing credence to the hypothesis that the coins originate in southern France, perhaps at Arles, or Narbonne, or Toulouse or Lyons; mints associated with the Merovingians, Burgundians, Ostrogoths and Visigoths.

The Merovingian associations, consequently, are much stronger in regard to provenance and numismatic tradition. Many VPW tremisses have been attributed to them by Tolstoï, Lenormant, Prou, Belfort and Le Gentilhomme as well as by others.<sup>12</sup> Reinhart further attributed all the Anastasius issues with pectoral crosses after 507, to Merovingian mints in southern France.<sup>13</sup> Belfort's catalogue lists many in the name of Anastasius and Justin I and attributes them to the mints of Narbonne, Toulouse, Troyes, Trier and Lyons. The Lyons group for this period would have to be Burgundian; the Narbonne group Visigothic; and the Toulousan coins only Merovingian if it can be proved that they are minted after 507; otherwise they too would fall into the Visigothic category. This would leave to the Merovingians the Troyes, Trier and Toul attributions which number in all five. Both numbers 4355 and 4356, which are in the name of Justin I and bear the letter T in the field to the right of VPW and Δ to her left, are questioned as Troyes or Trier, while number 4357 in the name of Anastasius which only has the letter T in the field left to the VPW is given unquestionably to Troyes. Extraordinarily enough, though not in the field of barbaric numis-

<sup>11</sup> See Chart VII.

<sup>12</sup> Tolstoï, II, pp. 213-214, nos. 156-162. Besides the works of Belfort and Prou already cited, the studies of Charles Lenormant are largely outdated but still of interest and some importance. The best and most recent study is that of Le Gentilhomme, *RN* 1943.

<sup>13</sup> Reinhart, *Tolosanischen*, p. 123.

matics, this last coin (No. 4357), given to Troyes, is very similar in style to the coin (No. 4327) which is given to Toulouse and to the coin (No. 4479) which is given to Toul (Menthe-et-Moselle). Obviously "guesswork" has played too important a rôle and the results often verge on the absurd. We are involved with material in which there is no strong dividing line between fact and fiction, and M. Belfort's attributions must be seriously questioned.

What might give more credence or justification to attributing the VPW anonymous issues to the Merovingians are the number, although small, which bear the names of Merovingian kings with or without the emperor's name. These occur with the name of Theodebert I (534-547) and Childebert I (511-558) in two groups, the smaller one in which VPW appears as traditionally, and the larger one in which the VPW figure is without the palm branch.<sup>14</sup> This latter development is a diemaker's oversight when copying the design from worn dies or coins. If all of the Lyons attributions are discounted by virtue of their descending from possible coins issued under Burgundian rule, we are left with an extremely small amount of coins (nine out of seventeen) that may descend from Merovingian mints during the reigns of Anastasius and Justin I. These coins reveal: (1) that the VPW type is very rare for most sixth century coins bearing mint marks; (2) that a small number of mints may issue it; and (3) that most of these, from which the majority of the VPW coins come, are mints that were not Merovingian in the first thirty-five years of the sixth century.

The consequent rapidity in which Merovingian coinage degenerates with excessively crude elements in design and format (See PLATE C, 10-12);<sup>15</sup> its failure to make an organized abstract pattern from the Victory figure (certainly achieved in national Visigothic coinage of Leovigild); and its failure to produce a unified stylistic pattern universal to all mints issuing a Victory, seem to point to both a governmental disregard for the VPW type and the lack of tradition for the VPW in the Merovingian mints. There is little stylistic

<sup>14</sup> Belfort, II, p. 187, no. 2295; III, pp. 285-286, no. 4359. Belfort attributes the Childebert coins to Childebert II, but Prou's attribution to Childebert I seems more logical.

<sup>15</sup> Prou, p. 23, nos. 86-88, pl. II, 19-20; p. 124, nos. 534, 535, 537, pl. X, 1, 2.

resemblance between many of the earlier issues and the late coins of Childebert, and there is nothing comparable to the stylistic development that is climaxed by the VPW of Leovigild the Visigoth. The late Visigothic VPW tremisses contemporary with or earlier than Childebert are unquestionably the product of a long tradition, of system, and of government-controlled mints. The later royal Merovingian VPW issues have the quality of being imitations rather than descendants from original issues.<sup>16</sup>

When these stylistic points are coupled with the fact that the VGC is really the more popular Victory form in northern Merovingian (Austrasian) mints, so much so that Prou could say that most Merovingian Victory tremisses are of the VGC type, it is possible to question any Merovingian rôle in the initiation of this tremissis.<sup>17</sup> We see Merovingian money being executed by inexperienced local goldsmiths or moneyers with no or few traditional or professional associations with the former imperial mints, and with seemingly little central control. It is from the imperial mints almost exclusively or their vicinity that the imperial type of VPW is issued in the sixth century in Merovingian territory, imperial mints that had been Visigothic or Burgundian before they passed into the hands of the Franks. This is remarkably true even for the VGC type, which was noted by Prou as coming particularly from the areas associated with the Burgundians; mints of Lyons, Chalon, Lausanne, etc.<sup>18</sup> All strictly Merovingian mints begin exclusively with the several varieties of national coins with names of king and atelier and for types, crosses or monograms or both.

<sup>16</sup> Le Gentilhomme, *RN* 1943, p. 97. Le Gentilhomme describes the quantities of VGC and VPW struck by the Franks as being "*d'une maigreur particulière, dépourvue, toutefois, de la marque de cette déformation géométrique propre aux effigies des espèces frappées dans le royaume de Tolède.*" He also notes that the fabric differs from the Spanish items.

<sup>17</sup> Prou, pp. xx-xxi. Note Reinhart's publication of the Merovingian Hoard of St. Marguerite à Monneren (Northeast of Metz in German Lotharingia) which dates from the second half of the sixth century. Of the forty tremisses in the hoard, only two are of the VPW type, the rest being VGC. Of these two VPW coins, one (PLATE 4, 3) I would classify as Visigothic in Group JAN 2; the second coin (PLATE 4, 4) I would classify as a crude variation of JAN 2 and most likely a Merovingian imitation of a Visigothic coin. Reinhart, *Merowinger*.

<sup>18</sup> Ibid. Also see Le Gentilhomme, *RN* 1943, p. 97.

The type, then, survives in definite Merovingian coins only where the mint has had previous Visigothic or Burgundian association and possible late fifth century imperial relationship. The only major mint suggested for the early attributions which was in the hands of Clovis and the Franks before the fall of Burgundy in 534, was Toulouse, and this was only so since 507. This may very well be the mint of all the VPW and VW (Victory with wreath only) coins given to Trier, Troyes and Toul on the basis of the T in the field of the reverse.

If, then, the Merovingians initiated this coin, it would be first from Toulouse in 508, at the earliest. Reinhart's suggestion qualifies this. The Visigothic VPW issues of Toulouse, Reinhart said, were continued by Clovis who placed a cross on the chest of the obverse portrait.<sup>19</sup> Reinhart therefore considered the Visigoths as the initiators and attributed the invention of the pectoral cross of the obverse portrait to Clovis, the successful Christian crusader, on coins minted from the newly captured Visigothic treasure. This suggests that the Visigoths, so ignominiously defeated by Clovis, would adopt a device associated with him. It seems unlikely, for the stylistic grouping of the coins indicates a development toward the placement of the pectoral cross rather than an abrupt or immediate die change.<sup>20</sup> Just as unlikely is the idea that the Merovingians were the first to reissue the VPW tremissis. Little of the significance of the VPW and its VICTORIA AUGUSTORUM legend must have been understood by the Franks, the most recent barbarians. It would seem a rather inappropriate type to commemorate an orthodox Christian victory over an Arian king, or for Clovis' provincial orthodox ministers to suggest. The entire development of Merovingian national coinage in the sixth century would indicate the adoption and continuation of coin issues in mints recently conquered rather than the initiation of a new issue. It is not to Rome or to Ostrogothic Italy that Clovis looks. His honors come from the emperor in the East who has made him Consul after his victories over the Visigoths,<sup>21</sup> and his propagandists are the orthodox Christian clergy of Gaul.

<sup>19</sup> Reinhart, *Tolosanischen*, pp. 123-124.

<sup>20</sup> See coin no. 3 in this Corpus. (PLATE I)

<sup>21</sup> Gregory of Tours, II, p. 78 (Bk. II, 28).



The major reason for Burgundian attributions is the reading of monograms on the field of the reverse as belonging to Gundibald, Sigismund and Gundomar.<sup>22</sup> It has been customary to attribute all of these to the mint at Lyons, although only one coin in the entire group listed by Belfort had any mark that might associate it with that mint.<sup>23</sup> Nevertheless, it is natural to attribute them to the capital of the Burgundians which had a long imperial mint history. Other coins without monograms have been assigned to the capital of the Burgundians on the basis of their stylistic similarity to those coins bearing monograms. Since we have no VPW coins with the names of a Burgundian king in the legend, it is on the acceptance of the monogram interpretations and particularly of the certainty of the "Sigismund" monogram combined with their provenance that has assigned these coins to the Burgundians. The coin hoards of Alesia (1804) and of Gourdon (1846), both found in Burgundian territory and both containing over one hundred coins and buried within the reigns of Justin I and Justinian, would encourage the idea that VPW tremisses were in circulation here.<sup>24</sup>

When we connect these hoards to the already noted rôle of Lyons in the minting of VPW and VGC types and the monogram identifications, it is not unreasonable to consider that the Burgundians did mint this coin in the time of Anastasius, Justin I and Justinian. Mateu y Llopis went so far as to suggest the possibility that the Burgundians were the first issuers of this type, although his dating this in the reign of Sigismund (516–524) would seem to be in error, disregarding as it does the coins bearing the monogram of Gundibald.<sup>25</sup> The stylistic design of types on Burgundian coinage remains fairly respectable on the whole, reflecting the influence of the old Imperial mint at Lyons. The VPW type would be in order since it was a frequently used type on Lyons issues and since Lyons itself bears strong ties with Augustus. Here was to be found the Augustan Altar of Victoria Augusta. Here also was the provincial and military

<sup>22</sup> Belfort, II, pp. 173–178, 179–182. *Le Gentilhomme*, *RN* 1943, pp. 92–93.


<sup>23</sup> Keary, pl. I, 10, 11. *Le Gentilhomme*, *RN* 1943, p. 93.

<sup>24</sup> Descriptions of these two hoards can be found in the following: Amecourt, *Châlon-sur-saône*; Blanchet; Maillard, *Alise*; Rossignol; Lenormant.

<sup>25</sup> Mateu y Llopis, p. 129.

center of Gaul, particularly after the abandonment of Trier in the early part of the fifth century.

Gundibald with his provincial advisors could have initiated this type after the death and defeat of Godegisel and the unification of the Burgundian kingdom under Gundibald after 500. This would coincide with establishment of the one capital at Lyons. The Burgundians do strike a large amount of the VGC type, however, and Robert's theory might apply here. For him southern Gaul (particularly modern Provence) had been long accustomed to Roman institutions with their centralized monetary policy and guaranteed prices, and they consequently maintained the imperial type and legend traditions of the few great mints such as Lyons and Arles. Rather than replace these types and legends with those of the new king, they always looked to the Roman Emperor.<sup>26</sup> Although the use of the VPW type might have an appropriate meaning for Gundibald's victory and the emergence of a unified Burgundian nation with its own code of law, there does not seem to be any sound reasons for the Visigoths to imitate or to do the same. Neither together nor separately do Gundibald, the Burgundians, or the mint at Lyons offer a sufficient *modus vivendi* for the VPW tradition which continues in Spain into the reign of Leovigild.

When the Visigoths are considered, there are a number of incontestable facts which connect them with these coins; the existence of the VPW tremissis in the name of Leovigild; the stylistic similarity of many of the anonymous tremisses with those bearing the name of Leovigild; and the large number of such VPW coins found in Spain and in Spanish collections. The Visigothic minting of this coin has been unanimously accepted. To the Visigoths have been attributed a share of the tremisses without monograms (others to Franks and Vandals and Ostrogoths), those with a monogram () erroneously interpreted as Amalaric or Narbonne, and for the most part only tremisses of the VPW type.<sup>27</sup> Regrettably, of all the coins of this pre-Leovigild period found in Spain, only one hoard has been kept

<sup>26</sup> Robert, *Maurice Tibere*, p. 429.

<sup>27</sup> *BMCVOL*, p. 56, n. 1. See also Robert, *Languedoc*, II, pp. 14-15. These compare with the material cited by Heiss, p. 76, and Gabriel, pp. 137-140. This monogram should read as MAR, for Gundo MAR, the Burgundian.

intact and available for study. This, the *Zorita de los Canes*, comprises ninety pieces beginning with coins in the name of Justinian and extending to the possibly last Leovigild VPW issue.<sup>28</sup>

There is strong stylistic evidence for a continuous and parallel development in coin issues from the time of Anastasius to that of Leovigild. In fact, the aesthetic approach and propensity for abstract design so evident on Visigothic national coinage down to ca. 714 is identical to the design principles of the pre-Leovigild anonymous issues. Visigothic art is characterized by an extremely simple, direct, austere statement. No matter how abstract, the symbol never loses its recognizable integrity. There is, as one might expect, a carefully organized sense of proportion and order. Legends never usurp their boundaries, do not invade the field, do not mix with the types. There is an overall discipline in stylistic or mint groups within which a tremendously creative sense of individualism exists. Within the rigid bounds there is freedom and variety. A freedom, however, much controlled. That dichotomy so particularly Spanish, the struggle of the real and the mystic, already is apparent here.

The undisciplined vagaries of the earliest national Merovingian issues in both legends and type and in total design are quite different from the Visigothic formulae. This distinction in contrasting the styles of the early national coinage of both nations must be traceable in the pre-national coinage. There is evident then a distinctive way in which imperial types are imitated and developed in the mints of the Franks and the Visigoths, which is not negated by a possible similar source and common origin in southern France. Circumstantially, on the basis of what the Visigothic mints do with the VPW tremissis and in the advanced degree of their total commitment to the striking of the VPW type until Leovigild's numismatic reforms, we are encouraged to accede to the Visigoths a more important rôle in the minting of the VPW Anastasius tremissis than to the Merovingians or even to the Burgundians. One feels more assured to suggest that the VPW coins were issued in southern France at Visigothic mints and were imitated by the other barbarian groups

<sup>28</sup> *Zorita de los Canes*. This hoard which was published by the archaeologist J. Cabré y Aguilo is now deposited in the Museo Arqueológico Nacional, Madrid.

once their victories secured for them some of these same mints and the Visigothic treasure.

It is even easier to justify Visigothic adoption and revival of the type. Certainly the political meaning and association of the VPW were intelligible to the Visigoths and applicable, as suggested by D. A. Fernández Guerra in 1854 “..... *Los áureos visigóticos tuvieron el objeto exclusivo de recordar victorias, beneficios de la religión, piedad o munificencia de los Reyes, duros escarmientos u otros sucesos memorables. Las medallas visigóticas, son, pues conmemorativas.*”<sup>29</sup> At the beginning of their settlement in the Empire and after the Battle of Adrianople (A.D. 379) they had been induced to become federated allies by Theodosius. They were free and semi-independent, still remaining a nation, neither provincial nor Roman citizen and paying no tribute for land but receiving government pensions. For this they were obliged to serve as federated soldiers under their own chief for the Empire. They had a legal status in the Empire beginning in 382, and although their relations with the emperor experienced many non-fraternal vicissitudes it did not affect their feeling the necessity of having some legal agreement with him. The pro-barbarian Jordanes admits to their ravaging the lands of the Empire but only when they were victimized by imperial treachery, deceit and breaking of promises and treaties.<sup>30</sup>

Of all the late barbarian groups, the Visigoths are the first to settle legally within the Empire and from the first are legally and militarily associated with the emperor. Aside from the Ostrogoths, no other group has seen so much of the Empire from Constantinople to the Pillars of Hercules, and none has had more opportunity and time to become Romanized. Their past is glorious, even if by 500 they are living on their laurels. Until their defeat in 507, they possess the largest and one of the richest nations in the West. The prestige of the Battle of Adrianople is only seconded and surpassed by Alaric's Sack of Rome (410). They are the first to sack imperial Rome, the Roma Aeterna, the Roma Invicta. An immemorial

<sup>29</sup> Mateu y Llopis, p. 47. This is quoted from an unpublished manuscript generally incorporated in the *Historia de España desde la invasión de los pueblos germánicos hasta la ruina de la monarquía visigoda*.

<sup>30</sup> Jordanes, XXV–XXVIII.

blasphemy. Yet, at this time Alaric is a rebelling *Magister Militum* of Illyricum. The treaty with Honorius in 418 re-establishes their *foedus* status and grants them the legal and political right to occupy Roman territory in Gaul. For this imperial recognition Wallia undertook to rid Spain of all other barbarians. Of these, only the Asding Vandals and the Suevians were able to save some of their settlements, and annihilation of the Silung Vandals and the Alans gave the Visigoths *Aquitania Secunda*. The ambiguity of a nation within a nation did not restrain the Visigoths from enlarging their territory when expedient or of considering their lands a veritable kingdom, although Rome still considered the area as a province and governed the Roman provincial population living in it.<sup>31</sup>

Nevertheless, we should not underestimate the Visigoths' ability to Romanize, nor their feelings about Rome, nor the continuance of Roman prestige. The Visigoths, who participate with the Romans in the defeat of Attila at Châlons, are perhaps the most important factor there. Their panegyrists can truly picture them as upholders of Empire.<sup>32</sup> Orosius, speaking of an even earlier King, Ataulfus, Alaric's successor, tells us that this Visigoth had admitted that only by renewing and increasing the Roman name with the arms of his Gothic followers could he achieve immortality, remembered by posterity as the restorer of Rome.<sup>33</sup>

The name of Rome still had the power to attract and be revered. It was a symbol of civilization and the glories of past invincible and universal power. As such it would never lose the psychological allegiance of the Visigoths. It is impossible to think that the Visigoths behave any differently from the large number of other barbarians who sought for a place in the society of the Empire. The manner in which the late Roman society is Germanized reveals how unopposed to this society the barbarians were and how undesirous they were of tearing it down. Barbarians such as Merobaudes, Stilicho, Bauto and Arbogastes had risen to positions of power and were married into Imperial families. One was even grandfather of Theodosius the Great. It was not so much Roman versus barbarian as it was

<sup>31</sup> Ibid., XXX.

<sup>32</sup> Ibid., XXXVIII.

<sup>33</sup> Orosius, VII, 43.

barbarian versus barbarian in the struggle to find a place in the sun. Even Alaric's military exploits were aimed at gaining a more satisfactory and secure position within the borders of the Empire.<sup>34</sup> Their vigorous blood, unfortunately, could not rejuvenate that which their desire helped to destroy. But if they were instrumental in the final killing of a dying organism they at least kept its memory and prestige alive.

The most politically intelligent barbarian leaders saw Rome and their position as did Theodoric the Ostrogoth. Theodoric, aside from his unselfish interest, set out for Rome to restore it to the Empire and to destroy Odovacar, the previous restorer.<sup>35</sup> But by the sixth century the behaviour of kings such as Alaric II and Gundibald and Sigismund as well as Theodoric certainly reveals "barbarians" as statesmen respectably concerned with the stability of national life, which was threatened always by the imperialism of the least Romanized Franks.

Theoretically and politically rather than realistically, the barbarian kings founded their legal authority on the foedus connection with the Roman emperor and could pose as maintainers of the Pax Augusta, the bulwark of Empire. They were agents of the emperor and, after the expulsion of Romulus Augustus, they gave their token allegiance to the Eastern emperor, because he alone had imperial dignity in the Mediterranean. He is for them a kind of proxy Roman Emperor and their allegiance is never removed from Rome. The transfer of the regalia of the western emperors to Constantinople by Odovacar and the Roman Senate best symbolizes this.<sup>36</sup>

Without an emperor in the West and because of commercial expediency for maintaining an acceptable international coinage, the VPW coins were issued in the names of Anastasius, Justin I, Justinian and Justin II. This is also a result of the tradition of imperial monopoly of the imperial image on the gold coinage rather than of real obedience or obeisance.<sup>37</sup>

<sup>34</sup> Bury, *Invasion*, p. 66.

<sup>35</sup> Jordanes, LVI, 29.

<sup>36</sup> Hodgkin, *Theodoric*, pp. 106-107.

<sup>37</sup> Procopius, *Bell. Goth.*, III, XXXIII. Also see Robert, *Maurice Tibere*, pp. 423-424.

The Visigoths under direction of the Roman emperor had acted as his agent, the agents of Victoria Augusta in Gaul and Spain. They too partook of the auspices of Victoria by this legal connection with the Roman emperor, the rightful heir of Octavian Augustus. Victoria favored them as the "Restitutor orbis Romani."<sup>38</sup> No barbarian kingdom, other than that of the Ostrogoths, would have had more justification for the adoption of the palm and crown Victory either as military cohorts of the Roman army or as legal political leaders of part of the Roman State, thereby partaking of some of the dignities of imperial tradition. Ironically, no one deserved it so much as those who had first shown their prowess in conquering Rome itself.

Yet, with all this circumstantial evidence, there are still problems in awarding the Visigoths the rôle of initiator. Their control of all of southern France west of the Rhône and along the Riviera (the major provenance area of the Anastasius groups) and the imperial and non-imperial mints of this area (Narbonne, Toulouse, and particularly Arles, that most Roman of provincial cities) would certainly only give them priority before 507 in the issuance of this coin.<sup>39</sup> This would imply that Alaric II is a minter of this coin and the possible initiator, a rather ironic choice for this unbellicose man. If however these tremisses are issued between 507–518, the hypothesis is confused by Visigothic disgrace and defeat; loss of the state treasure at Toulouse;<sup>40</sup> and the presence of Merovingians, Burgundians and Ostrogoths in former Visigothic territory. Most important is the loss of two key mints, Toulouse to the Franks (if we accept the thesis of Reinhart and others of coins being minted there) and Arles to the Ostrogoths. Narbonne which is seized jointly by Franks and Burgundians is retaken for the Visigoths by the Ostrogoth, Count Ibbas.

If the Visigothic mints (i.e., Narbonne) initiate this coin after 507, it would have to be by Amalaric after 510, since the retaking of Narbonne is not achieved until 510, and the equivocal-unstable position of Gensalic would not seem to permit a new coin issue. Nor would the

<sup>38</sup> Orosius, VII, 43.

<sup>39</sup> Reinhart, *Tolosanischen*, p. 117.

<sup>40</sup> Gregory of Tours, II, 27.

issuance of the coin by Gensalic recommend it to Amalaric, Clovis, Gundibald or Theodoric. If hypothetically the coin is issued after 510, it must also have been issued before Gundibald's death in 516, if we accept the identification of his monogram on some of these coins. If we carry this further, such an issue minted between 510–516, by the Visigoths would have had to have been done with the knowledge and permission of Theodoric the Great, who is the regent of his grandson Amalaric and who ruled Spain in his own name until his death in 526.<sup>41</sup>

There are too many qualifications yet to be established, and more circumstantial evidence to be considered before we can attempt to approach problems in dating, although they are inseparable from the problem of finding an initiator and prototype. Since the Ostrogoths are inseparable from Visigothic affairs after 510, it is necessary to consider the possible rôle that they may have played.

It is on the basis of style that VPW tremisses have been attributed to the Ostrogoths. Wroth catalogued two coins as being from Rome because of the "comob" inscription on one and the style of the head on both which coincides with several VGC coins attributed by him to Rome.<sup>42</sup> Wroth also characterizes Ostrogothic and Italian tremisses as possessing a comparatively high relief for types and lettering.<sup>43</sup> The fineness and the purity of the design are also considered characteristic of Italian Ostrogothic mint products. The attribution of VPW tremisses to the Ostrogoths, however, is not in accordance with the VGC majority found in Italy and Italian collections. By the coins extant, one may conclude that, if the type is minted in Italy, it is part of a limited issue, since the VGC tremisses are more preferred and more common.

Furthermore, because of the quasi-autonomous bronzes of Theodoric and their variant precursors, the Zeno-Odovacar bronzes, the attribution of this limited tremissis issue to the mint at Rome is not necessarily rash nor inconceivable. There was no mint in the Roman world with more right to the use of the type, as well as possibly no mint in the Empire more contemporarily connected with the type.

<sup>41</sup> Bury, *Invasion*, pp. 205–206.

<sup>42</sup> *BMCVOL*, p. 56, n. 1.

<sup>43</sup> *BMCB*, I, p. 74. Also see Friedlaender, *Ostgothen*, p. 24, pl. III, 5.



The Theodoric substitution at Rome of the VPW for the trophy-bearing Victory on these bronzes might be the first indication of a prevalent attitude of the desire to distinguish coins of the new reign from those of the old. But these issues at Rome are quite out of numismatic character with Theodoric's general policies of "regnum nostrum imitatio vestri." His gold coinage is a relatively faithful reproduction and duplication of contemporary imperial money.<sup>44</sup> Theodoric, always careful to read his king's rôle as subservient to the emperor's in Byzantium and to maintain traditions, never put his own portrait on any coin nor his name except on the three solidi gold medallion.<sup>45</sup> Consequently, the use of the VPW type on the tremissis attributed to Rome is out of line with Theodoric's policy, a policy which faithfully imitated the VGC imperial tremissis. It would be unnatural then not to consider the scant minting of these for a specific event or purpose.

It would be even more unnatural not to attempt to find a connection between the Anastasius VPW medallion and the Theodoric medallion and the VPW tremissis issue. These may be connected with the reconciliation between Anastasius and Theodoric just before 500, and Theodoric's triumphal six month visit in Rome. These rare commemorative usages of the VPW type distinct from the imperial and Ostrogothic coinage may be significant for the VPW tremissis issues of southern France. However, the Anastasius medallion may not require any particular explanation, since small medallions such as this might have been issued annually.

If the initiative for the West comes from the mint at Rome, if in its products we have the prototypes for the other barbarian issues, the responsibility is as much Roman as it is Theodoric's. Of all the rulers in the West contemporary to Anastasius, Theodoric alone

<sup>44</sup> Theodoric did not always follow exactly Byzantine patterns. In his solidi issues he ignored Anastasius' changes, the removal of the infulus of the diadem and the substitution of a chrismon for the traditional long cross. Later, when Justin I introduced the facing Victory-Angel on the solidus, Theodoric retained the Victory-Angel standing to the left. In both cases he maintained the traditions of the Italian mints. See Le Gentilhomme, *RN 1943*, pp. 86-87.

<sup>45</sup> *BMCVOL*, p. XXXI. Theodoric did put his monogram on some gold and silver issues. *BMCVOL*, p. 46, no. 3.

possessed the stature, prestige and connections, and the military, political and personal qualities necessary for the rôle of "Restitutor orbis Romani." By virtue of himself and his people and his control of Rome and Italy, he had the influence and position necessary for establishing precedent. Only Theodoric possesses the regalia of the Roman emperors. Only Theodoric was to be immortalized in both orthodox and folk history.<sup>46</sup> He was the prototype for Charlemagne and the Holy Roman Emperor. Theodoric, Arian though he was, first met the Pope in his church before his triumphal entrance into the city of Rome.<sup>47</sup>

The gold medallion presents Theodoric in all his dignity as Rex and Magister Militum, the protector and guardian of the Roman Senate, the Roman People, and the Roman Tradition. Its legends propagandize this: REX THEODORICUS PIUS PRINCIS; REX THEODORICUS VICTOR GENTIUM. The prestige of Rome seems for the moment reborn, and the old Victory type with a long history of association with imperial gold and silver and senatorial bronzes again appears to declare itself as Roman. It does so on a medallion of the only Goth in the West who was a Roman citizen, who bore the title of "Patricius," and who considered himself to possess imperial blood.<sup>48</sup> Contemporary literary and epigraphical sources prove the high regard the native Italian population had for him and his unquestionably enlightened rule.<sup>49</sup> The prosperity his rule engenders and his vast building and restoration projects cause contemporaries to compare him with Trajan and Valentinian I, curiously, two emperors who made especial use of the VPW type.<sup>50</sup>

Aside from the prestige he gained from the honors granted to him by the Roman and the Italian people, Theodoric played an important and paternal rôle in Western Europe. All of the evidence points to his close cooperation with all kings, even interfering in their affairs in order to maintain peace and the status quo. Here is a statesman. He seems to have conceived the idea of a system of German states

<sup>46</sup> Hodgkin, *Italy*, III, p. 341. Also see Hodgkin, *Theodoric*, pp. 371-372, 426; Ensslin, pp. 341-354.

<sup>47</sup> Anonymi Valesiani, p. 324, no. 65.

<sup>48</sup> Cassiodorus, IV, 1, 2. Also see Bury, *Invasion*, pp. 189-195.

<sup>49</sup> Hodgkin, *Theodoric*, p. 242. Also see Anonymi Valesiani, p. 322, nos. 59, 60.

<sup>50</sup> Anonymi Valesiani, p. 324, nos. 65-72. Also see Cassiodorus, II, no. 39.

in the West, playing the rôle of a patriarch in a family of kings to whom he was related: the father-in-law of Sigismund and Alaric II; brother-in-law of Clovis and Trasamund; uncle to the wife of the King of the Thuringians.<sup>51</sup> This matrimonial state system is indicative of his prestige in Western Europe and is best illustrated in his correspondence to avert the Frankish-Visigothic War in 507.<sup>52</sup> The moment of his greatest prestige is the victory of his troops and generals in southern France in 510, and his governing as king or regent in Italy, Provence, Narbonne and Spain. That he is the uncontested ruler, no matter in which of his two positions, is seen in his orders to Amalaric's mint workers: "..... monetarios autem quos specialiter in usum publicum constat inventos, in privatorum didicimus transisse compendium. Qua paresumptione sublata, pro virium qualitate functionibus publicis applicentur."<sup>53</sup>

The rôle of Theodoric in the wars to rid Provence and Narbonne of the Franks and Burgundians is the traditional one of Augustus. He is, as was Augustus through his generals who owed their imperium to him, the restorer of peace and the bearer of all of the fruits of the Pax, Victoria and Felicitas Augusta. Consider all of his measures to re-establish business and trade in Provence, to resuscitate the fortunes of this ravaged land, and to give tax relief to its inhabitants until civilized life had restored itself.<sup>54</sup> There was no other who so deserved or merited the title of "Restitutor orbis Romani," or who deserved the regalia of the precursors of Augustus and more rightly deserved to inherit the Victoria Augusta as a true descendant of Augustus.

Can anyone but Theodoric fit the hypothetical image we have created of the initiator of the VPW tremissis? We have previously determined that the coins were issued as respectable commercial currency of good weight and quality; that there was no intention to have these coins confused or mistaken for Byzantine issues. They were issued to be distinguished from imperial currency yet equally trustworthy and therefore commercially acceptable. They were

<sup>51</sup> Anonymi Valesiani, p. 322, no. 63. Also see Hodgkin, *Italy*, III, p. 356.

<sup>52</sup> Hodgkin, *Italy*, p. 356.

<sup>53</sup> Cassiodorus, V, 39. Also see Reinhart, *AEA* 1945, p. 221.

<sup>54</sup> Cassiodorus, III, 32, 38, 40-44.

minted in the West by a ruler or rulers who were allied to Anastasius and acceded, diplomatically at least, to his suzerainty, and at the same moment announced his or their independence. There is an understanding of the commemorative associations of the VPW and the Victoria Augusta with Rome, or its Senate or its emperors, or Octavian Augustus. The initiator is governed by other than religious values in selection of the type, and he may not be orthodox Christian by virtue of this type selection. He or his mint has the prestige to establish a precedent to be imitated by others. In addition the minter must be intimately involved with southern Gaul and with the Visigoths and then with the Burgundians; the coins must have been minted by 516, with the death of Gundibald. Certainly none other than Theodoric and Rome could fit the picture.

Vandalic minting can be either discounted or relegated to imitating the issue established by another ruler. Merovingian minting has all of the qualities of imitating a type of another nation or of continuing a type issued by a mint that has been recently conquered, since the type is rarely issued in Merovingian royal mints and only rarely in the south. The Burgundians who are more familiar with the VGC as are the Ostrogoths, do mint this coin with a royal monogram, a device which may have been used to distinguish their coins from those issued by another nation without monograms. Since monogrammed coins are far smaller in number, we may again see these as parts of a small issue rather than of a major one. Visigothic minting seems most definite and most centrally involved, but several circumstances prevent the acceptance of Alaric II in the rôle of prime mover: (1) his weak personality; (2) the Lex Burgundia's condemnation of his gold coins as being bad; (3) the improbability of Burgundians or Vandals or Ostrogoths imitating his coin; and (4) the difficulty of associating the issue with any specific commemoration. In regard to the Ostrogoths, although the strongest case can be made for Theodoric's participation, we have to justify the fact that Ostrogothic mints by virtue of Italian hoards and provenance predominately issue the VGC tremissis and that in all issues faithfully imitate Byzantine issues. If we accept an Ostrogothic source for these tremisses we must hypothesize either that they were not issued for use in Italy but for export or as part of a

commemorative issue in small numbers. If they were issued after 510, a stronger Ostrogothic case can be made. Perhaps then they were issued for their new provinces in Gaul or perhaps Theodoric, as regent, has ordered these issued in or for his Visigothic lands.

A final decision in regard to mint initiator cannot be made until all hypotheses for dating the coins are considered. Nevertheless, the Theodoric-Visigothic association provides a basis for the strongest hypothesis and perhaps the only possible one.

## THE DATING OF THE TREMISSIS

### A. THE DATE OF THE FIRST ANASTASIUS VPW ISSUE

An understanding of Roman provincial life in both Gaul and Spain in the fifth century is necessary in order to establish the year and attendant circumstances of the initial striking of the VPW Anastasius tremissis. Increasing investigations in this "chaotic" period clarify numismatic developments. There are still too many lacunae in our numismatic information. If we relate our numismatic material to other known historical and cultural data, a more complete picture is possible. An image can be formed then of the barbarian mentality, its *modus vivendi*, its attitude towards the government and citizens of Rome, and its interpretation of its status within the Empire.

A cursory reading of a few sources modifies the extremist attitude that chaos is the character of this age. It would be naïve to contend that the barbarian invasions are not accompanied by the usual physical and spiritual destructive consequences of war. Chaos as a state of physical reality is a momentary condition; it is more real and more lasting as a state of mind. Fifth century society moves as rapidly as it can to restore the order of daily civilized life. Its intellectuals almost immediately embroil themselves in the search for a scapegoat, pagan or Christian depending on one's affiliation, in order to preserve the core of their moral, religious and political beliefs.<sup>1</sup>

The invasion of these tribes was, properly speaking, a resettlement. This amounted to a change in the make-up of the ruling class, with its old members retaining their class status but having to make room for these new recruits. The settlement naturally forced their relinquishing some land and wealth. What plundering occurred, and

<sup>1</sup> The best comprehensive discussion of this is to be found in Dill, *Roman Society*, pp. 285-291. Also see the writings of Sidonius Apollinaris, Paulinus of Pella, Flavius Felix Corippus, Procopius, Jordanes, Orosius and Cassiodorus. The best recent study is Courcelle's *Histoire Littéraire des Grandes Invasions Germaniques*.

it unquestionably did, was sporadic enough for Sidonius Apollinaris to describe almost uninterrupted rococo country life for the landed gentry.<sup>2</sup> For him, the barbarians are a new force to contend with in the already complex life of the Late Empire. The experiences of Paulinus of Pella are quite to the contrary, but Sidonius implies that such hardships were not generally or universally suffered.<sup>3</sup> The tragedy of the barbarian invasions was that they compounded rather than abolished the evils of the old system, too well maintaining the conditions of provincial life.

Although such periods of confusion occur, they are short-lived when the invaders are intent on settling. Government agencies reopen and reorganize with most likely the same staff, allowing for the possible loss of some of the staff due to the exigencies of death or flight. The advisors to the Roman governors and prefects now become the advisors to the barbarian rulers, e.g., the orthodox Catholic and "jurisprudens" Leo is chief advisor to Euric; the Elder Cassiodorus serves both Odovacar and then Theodoric. The Roman provincial jurists are certainly the inspiration behind the Lex Burgundia, the Breviarum Alaricum, and Lex Visigothorum. The clergy and the provincial senatorial class still travel to Rome, maintaining the old ties. The barbarian kings must encourage rather than impede these connections. They do not come into the Empire simply to maraud; they come to live and partake of the comforts of this civilization. Although credence may be given to Keary's view of a slow undermining of society, the gradual pauperizing of old inhabitants, the sapping of all industries and the reversing of all conditions favorable to trade;<sup>4</sup> the barbarians cannot bear the full burden of responsibility for the economic retrogression that was already in the offing before their resettlements.<sup>5</sup>

We have enough numismatic evidence, although still incomplete and not catalogued, to prove that at least some imperial mints

<sup>2</sup> Sidonius Apollinaris, I, pp. LXII-LXV, and LXIX; III, XII, 6; Bk. VIII, iv, I; Bk. VIII, xii.

<sup>3</sup> Ibid., Bk. VII, vi, 6; Bk. V, vi, 7.

<sup>4</sup> Keary, p. 71.

<sup>5</sup> The best accounts of this are to be found in Dill, *Roman Society*, and in Dalton's Introduction to his edition of the *Letters of Sidonius Apollinaris*.

remained open or reopened once peace was restored and were staffed most likely by the same hereditary class of mint workers.<sup>6</sup> Barbarians did not enter the ranks until long after the invasion.<sup>7</sup> There are large numbers of coins in the names of fifth century western and eastern emperors that by means of style and provenance cannot but be attributed to the imperial mints of Gaul, e.g., those at Lyons, Arles and Narbonne.<sup>8</sup> There is even evidence that new mints were organized such as those of Lugo and Braga by the Suevians as early as 420(?), in Spain<sup>9</sup> and that of Toulouse by the Visigoths.<sup>10</sup> These coins are mostly pure imitations of imperial issues distinguishable only by a lessening of imperial mint standards in regard to design and execution, which, as Keary suggested, was due to fewer controls imposed on old moneyers by less critical employers as well as an increasing number of inexperienced hands.<sup>11</sup> With the weakening of a central numismatic control, the increasing number of authorized and non-authorized private minters would aggravate the situation of declining standardization. We should not expect to find a different situation developing in numismatics than what has been evident in the monumental arts since the Age of Constantine. The aesthetic value system of the empire itself is changing regardless of the barbarian influx.<sup>12</sup> From the numismatic evidence, it appears that the greater the distance in time separating mint operation from the last imperial issue and the control of the imperial moneyer, the further the mint product strays from the aesthetic standards of the old empire. This is revealed succinctly when the stylistic development within the VPW tremissis is traced from the issues of Anastasius to those of Leovigild.

An analysis of the sixth century tremissis depends upon an understanding of the monetary circulation in the fifth century. Le Gentil-

<sup>6</sup> Keary, pp. 53-54. See also Prou, p. XIV; Robert, *Maurice Tibere*, pp. 423-424, 429; and Le Gentilhomme, *RN 1943*, pp. 56, 75, 92-93.

<sup>7</sup> Theodoric's order for better treatment of barbarians implies that few if any barbarians live in the cities. See Cassiodorus, Bk. V, 39, item 13.

<sup>8</sup> Reinhart, *Tolosanischen*, pp. 108, 117-118; Jahn, II, p. 13; Le Gentilhomme, *RN 1943*, p. 93.

<sup>9</sup> Reinhart, *Swebenreiches*, pp. 154, 166-167.

<sup>10</sup> Reinhart, *Tolosanischen*, p. 107.

<sup>11</sup> Keary, p. 53.

<sup>12</sup> *Ibid.*, p. 66.



homme presents the most recent and best survey.<sup>13</sup> The striking of gold dominates the activity of the western mints. Silver is issued in decreasing amounts, while bronze is rarely coined, except in considerable amounts in Ostrogothic Italy. Barbarian love for gold would have demanded and encouraged the continued minting of gold and should have necessitated a continuance of silver and bronze for normal commercial needs of the provincials. The latter however does not seem to be the case as evidenced by extant coins. The probable diminishing volume of trade in the West and its trade with the East would place a greater demand on the local market and the dealing in smaller denominations. The increasing self-sufficiency of the landed estates would aggravate the commercial crisis as well as remove the necessity for large volume and long distance operations. As the century progresses and this economic situation is intensified, there is a diminishing need for the larger coin denominations. By the end of the fifth century, the solidus is gradually being superseded by the tremissis.<sup>14</sup> Such a market would seem to predicate the maintenance of bronze and silver issues, but such issues are of decreasing interest for the barbarian kings. Only the Ostrogoths maintain a large coinage in all three metals for the commercial needs of the urban communities of Italy, just as the silver issues of the Vandals and the numerous small bronze issues from North Africa cater to their large urban population.<sup>15</sup> The rest of the West manages with coins already in circulation, Ostrogothic issues, and the intermittent issues of bronze and silver by Burgundians and Franks.

The small amounts of fifth century gold extant in comparison to extant gold of the fourth and sixth centuries must be accounted for by the barbarian hoarding of gold as coin or bullion, the melting of it to fashion ornaments, or the recoinage of it in order to pay taxes and tributes, and by the burying of it by provincials.<sup>16</sup> This scarcity is already revealed in the developing trends of the fourth century Empire where the increasing difficulty in maintaining a satisfactory

<sup>13</sup> Le Gentilhomme, *RN* 1943, pp. 58, 89. There is an absence of tremisses in fifth century hoards, but in those of the time of Justin I and Justinian the tremissis predominates.

<sup>14</sup> *Ibid.*, p. 92.

<sup>15</sup> Le Gentilhomme, *RN* 1943, p. 91.

<sup>16</sup> Keary, pp. 71-72. Also see Kent, p. 197.

gold coinage forced the imperial mint to demand a return of gold in bullion form.<sup>17</sup> There must have been large amounts of tribute gold in barbarian treasuries, nevertheless, not considering the amount reaped from plunder. The Visigothic treasure in literary sources attains fabulous and fictional heights. We are told that Alaric in the Sack of Rome not only carries off the Treasure of Solomon brought there by Titus, but also is conceded four thousand pounds of gold by Stilicho in the spring of 408, and five thousand pounds of gold and thirty thousand pounds of silver by Honorius in the autumn of that year, as well as being given thirty-five thousand pounds in precious metal by the Roman Senate.<sup>18</sup> This situation is repeated often throughout the fifth century. Besides tribute money there is ransom gold. The Ostrogoths, e.g., ca. 495, sent gold to Gundibald for the release of Italians held captive since Burgundian raids in North Italy ca. 490, during the war between Odovacar and Theodosius.<sup>19</sup> There would seem then to be more than enough gold available for the minting of coins for particular needs.

If it is true that the old Roman system and traditions do survive and continue through the fifth century and the evidence of earlier barbarian minting of gold is irrefutable, then we must accept the possibility that the VPW tremissis might have been struck from the very beginning of Anastasius' reign in A.D. 491. All the barbarian kings are minting coins with the exception of perhaps the Ostrogoth who does not succeed in Italy until 493.<sup>20</sup>

Since there is evidence of Roman mints striking from the same die designs after an interval of a century or so,<sup>21</sup> it is not inconceivable to find the practice of restriking of old dies, or copying of old die designs increasing in the less controlled barbarian mints. With even a tendency for a new mint to imitate whatever is available to copy,<sup>22</sup> it is

<sup>17</sup> Kent, pp. 203-204.

<sup>18</sup> Ulrich-Bansa, pp. 172-173. Also see Grierson, *Commerce*, for further ramifications of this problem.

<sup>19</sup> Ennodius, Sec. 154-164, pp. 95-99; Sec. 171-173, pp. 101-103.

<sup>20</sup> Reinhart, *Tolosanischen*, pp. 108, 110, 116-119. Also see the studies of Kraus and of Friedlaender.

<sup>21</sup> Grant, *Anniversary Issues*, pp. 51-52. Also see Vermeule, *Num.Circ.* 1952, pp. 356-367. An indispensable study is Vermeule, *Ancient Dies*.

<sup>22</sup> Keary, p. 67, pl. 1 and Ulrich-Bansa, p. 170. In regard to the character of the imperial portrait see Pearce, *Num. Review* 1946, pp. 125 ff.; *RIC IX*, pp. XL.

not surprising to have to contend with the problem that a mint might often strike a coin of a deceased emperor. Since there is evidence of the Ostrogoths indulging in this fiscal practice so as to avoid placing the name of their adversary, Justinian, on their coins, it has been suggested that the Visigoths in Spain did the same during the Byzantine reconquest attempts.<sup>23</sup> This was not the case in Visigothic Spain, as will be shown later. Here they took to jumbling the legend so that it became unintelligible. There is no stylistic or other evidence to indicate that all Anastasius coins do not date from the reign of Anastasius. A stylistic study will reveal that the coins of a given emperor in the VPW tremissis series were minted during the emperor's reign or up to the time when the news of the new emperor's accession was known.

The initial dating of this issue must be within the period of 491 to 518. Previous hypothetical conclusions encourage the connection of this issue with an event which affects the lives of the Visigoths and Theodoric. Although the initial rôle of the Burgundians has been questioned, the possibility should not be ignored. Both Burgundians and Visigoths could have minted this coin as soon as the news reached them of Anastasius' accession in 491, but what would have encouraged them not to continue their imperial imitation and traditional local issues which they had struck previously during the reigns of Leo and Zeno?<sup>24</sup> One could consider numerous dating possibilities within the reigns of Alaric II and Gundibald for a time when commercial or political expediency would necessitate a new coin issue.

If the Burgundians are considered responsible for the striking of these in their mints before 500, when the four sons of Gondovech share the kingdom, it might be attributed to a desire for a unified currency and a selection of type based on die traditions at Lyons, the major capital. When Gundibald unites the kingdom under his own rule ca. 500, the use of the monogram on the reverse field may have been inaugurated on these tremisses, or the monogrammed coins may have been issued at the same time as the non-monogrammed coins in order to distinguish those minted by Gundibald

<sup>23</sup> Kraus, p. 29.

<sup>24</sup> Le Gentilhomme, *RN* 1943, pp. 74, 86, 92, and pls. I-IV.

from those of his brothers. Gundibald's monogram series, however, would seem more appropriately issued after 500, when his hegemony would permit and demand the distinctive addition of the personal monogram. It is difficult to conceive of the Burgundians assuming the rôle of initiator after 507, of a coin also minted by Visigoths and Ostrogoths. Burgundian victories over the Visigoths would seem too short-lived to be so amply commemorated. Since there are a large number of VGC tremisses assigned to the Burgundians, it would seem more probable that the VPW tremissis was not so preferred and was a secondary or parallel issue. This might imply further that it was minted later than the VGC tremisses and therefore might not have been original with the Burgundian mints.<sup>25</sup>

A dating for a Visigothic initiation does not seem more likely. If issued before 507, it is issued by Alaric II, but several reliable sources condemn Alaric for issuing debased coinage, and this might possibly (but not necessarily) remove him from consideration, because the VPW Anastasius tremisses are of good quality.<sup>26</sup> Heiss denied the possibility of Alaric's minting this tremissis on the basis of this evidence,<sup>27</sup> but the possibility that this condemnation might apply only to some coins rather than to all must be allowed.

Certain events or policies during the reign of Alaric might predicate the adoption of the VPW type. Possibly it might have commemorated the alliance of the Visigoths and Theodoric and thereby the Emperor Zeno against Odovacar around 490, the victorious outcome of which saw the restoration theoretically of Rome and Italy to the Empire in 493.<sup>28</sup> Yet Zeno's successor, Anastasius, did not look favorably on Theodoric or on Zeno's alliance with Theodoric and was not to recognize Theodoric until 498, so that such an issue for this reason in the name of Anastasius would not seem likely.<sup>29</sup>

Besides this there is no other event commmemorable in Alaric's reign except for his war with Clovis. Could this have been a propaganda issue in preparation for the war? It would not be unusual for

<sup>25</sup> Ibid., pp. 92-93. Also see Lenormant.

<sup>26</sup> Mateu y Llopis, p. 135; Pérez-Pujol, IV, p. 473; Avitus, LXXXVII, *Lex Burgundia, Constitutiones Extravagantes*, XXI, 7, p. 342.

<sup>27</sup> Heiss, p. 75.

<sup>28</sup> Anonymi Valesiani, II, 53, p. 316; Hodgkin, *Theodoric*, p. 121.

<sup>29</sup> Anonymi Valesiani, 64, p. 322.

Alaric to see his rôle of maintainer of Roman culture in Gaul in the tradition of his more stalwart predecessors whose panegyrists saw them as "Restitutores orbis Romani." The rising threat of Clovis and the Franks might have encouraged an issue, rife with military import, which announced the legal right of the Visigoths because of their alliances with the Roman emperor to settle in Gaul. The magic of the Victoria Augusta was truly on their side. Thus might Alaric also have reminded his orthodox Catholic subjects that he and he alone had a legal right regardless of his religious affiliation. Alaric could have ordered the striking of the VPW tremissis anywhere between 500 and 507, when Clovis' intentions began to be obvious. It might have been completely in character for Alaric to do this, which for all its import might be an ineffectual device. Alaric did not inherit his father's (Euric) force of character and aggressive martial attitudes. His policy towards Clovis was that of a civilized conciliator. He did not resort to force to prevent treasonable practices of the provincial population and its orthodox church, nor to stop the advance of the Franks. He sent ambassadors and suggested diplomatic conferences. Even the preparation of the Breviarum Alaricanum, an abstract of the Imperial Code, may have been a conciliatory measure for the loyalty of his Roman subjects. This was also ineffectual for his purposes and too late. The Visigoths were already too softened by civilization, too Romanized to deal successfully with a true barbarian like Clovis.

Mateu y Llopis, Reinhart and Le Gentilhomme accept the hypothesis that Alaric II minted the VPW tremisses, and therefore begin dating these coins before 507. Mateu y Llopis considers Alaric II's Anastasius issues to come from southern Gaul, from the mints of Bordeaux, Toulouse and Narbonne.<sup>30</sup> Reinhart agrees with this but goes further in attempting to find reasons for the distinct usage of the type. He considered that the Visigoths adopted the VPW in the time of Alaric II for religious reasons, since he thinks that the VGC would have offended their Arian faith. This statement implies that the *globus cruciger* was associated with the specifically orthodox creed sanctioned by the Byzantine emperor, since it was so connected with Byzantium. Reinhart suggests that the VGC type was offensive

<sup>30</sup> Mateu y Llopis, pp. 133-140.

because it symbolized the victory of the orthodox creed over the Arian.<sup>31</sup> There is nothing to justify such a conception. If it is true then the Visigoths were alone in so thinking, for the Arian Ostrogoths and Burgundians did not find the VGC type obnoxious to their belief. This hypothesis seems to be contradictory to another of Reinhart's suggestions concerning the origin and adoption of the pectoral cross on the Visigothic obverse bust. He dated the Anastasius coins with the pectoral cross after 507, issued by Clovis who, possessing both the treasure and mint of the Visigoths at Toulouse, commemorated his victory over the Arian Visigoth.<sup>32</sup> Reinhart conjectures that the Visigoths adopted the pectoral cross initiated by Clovis in accordance with their typically Roman tolerant view, and we must assume that they were no longer prejudiced against the use of the symbol. In this way the pectoral cross coins were issued from Toulouse until the death of Anastasius. Reinhart attests to the Merovingian association of these on the grounds of provenance; pectoral cross coins are found more frequently in France, whereas he knew of only six in Spanish collections.<sup>33</sup> This is a non sequitur, since most Anastasius coins, pectoral cross or no, come from southern France, the site of the major Visigothic settlement. The move to Spain does not begin until after 507, and with the capital at Narbonne a large concentration of Visigoths would still reside in southern Gaul, Narbonne at least.

French provenance for this coin does not prove that it was any more Merovingian than Visigothic. Reinhart's hypothesis might seem a logical explanation of the manner in which the pectoral cross makes its possibly first appearance, but others would seem more appropriate. There are a few coins in which the advent of this cross is haphazard, rather than originally conceived with the rest of the design. Its presence seems due to an afterthought or correction or addition directed by a new policy. Note that No. 3 (PLATE I) shows that some of the original die has been altered by the scratching away of some of the folds to make way for the little cross which appears

<sup>31</sup> Reinhart, *Arte*, p. 54; Reinhart, *Merowinger*, pp. 40-41.

<sup>32</sup> Reinhart, *Tolosanischen*, p. 128. Also see Reinhart, *Merowinger*, pp. 40-41.

<sup>33</sup> Reinhart, *Tolosanischen*, p. 124. Reinhart associates the nonpectoral cross busts with the coinage of Alaric II, see Reinhart, *DJN 1940*, p. 75.

here as a jewel. Would it not seem incongruous for the Visigoths who, according to Reinhart, did not use the VGC type because it offended them, to adopt a symbol initiated by Clovis to commemorate their own ignominious defeat? There must be a better explanation for a tradition stylistically developed and maintained by the Spanish Visigothic mints. Could it have been added to ameliorate the pagan reverse for the orthodox Christian subjects and therefore give the VPW tremisses a Christian guise?<sup>34</sup>

There is no factual evidence or even substantial circumstantial evidence to enable us to establish an initial date before 507, and the death of Alaric at Vouillé. This is true even when we turn to consider Ostrogothic possibilities. Before 500, Theodoric's political prestige could not have been so great as to have Visigoths and Burgundians imitate his coin types. The western nations must have begun to realize the force of this statesman when he received the "ornamenta palatii" of the Roman emperor from Anastasius in 498. With the recognition of Theodoric by the emperor as his agent in Italy, Theodoric's prestige is enhanced and particularly distinguished from all other barbarian rulers of older and equally legal national positions. Of them all, Theodoric alone is the symbolic and actual inheritor of the Roman Augusti.<sup>35</sup> Theodoric's first visit to Rome is celebrated as an Augustan triumph and may even coincide with his Tricennalian feast of 500.<sup>36</sup> The three solidi medallion may very well communicate

<sup>34</sup> The presence of the pectoral cross on Visigothic currency is quite in keeping with the important position of the cross in Visigothic art. A Maltese cross form is the major religious and decorative symbol throughout the Visigothic period. It owes its dominance to the iconoclastic tastes of the early Spanish Church. Its regal associations on the votive crowns of Reccared, Reccesvinth and Swinthila suggest an old tradition. The number of pendant crosses found in the treasures of Guarrazar and of Torredonjimeno encourages one to suggest that these may be part of the Visigothic kings' regalia. It has never been satisfactorily determined whether or not these votive crowns and crosses were ever worn. The tradition of offering crowns must have begun with Leovigild, since it may be one of the Byzantine customs he introduced. However, I have never been able to find any record of a pectoral cross as being part of the Byzantine emperor's regalia. See Schlunk, *Visigodo*, pp. 311-313; Delbrueck, *Kaiserornat*.

<sup>35</sup> Ensslin, p. 82. Odovacar had sent the regalia to Zeno, see Cassiodorus, *Chronica*, pp. 158-159; Anonymi Valesiani, no. 64, p. 322.

<sup>36</sup> Kraus, p. 79.

Theodoric's acceptance by Anastasius and his triumph in Rome. Thus the VPW tremissis issue might also have echoed this, minted at Rome, in what would have had to have been a limited edition, and continuing as it does one of the types found in the quasi-autonomous bronzes. The change in type between the quasi-autonomous bronzes of Zeno-Odoacar and the possible Theodoric *Invicta Roma* from a Victory with wreath and trophy to a VPW on a ship's prow before a lighted altar would symbolize the change in Theodoric's status from a Victor to a "proxy-Augustus." From this moment, the paternalistic rôle Theodoric plays in the West would be in character with the position of a "proxy-Augustus." It is very dubious, however, that the other barbarian rulers conceived of Theodoric in this way. His threats stopped neither the Burgundians nor the Merovingians from their attack on the Visigoths.<sup>37</sup> His assumed rôle of "proxy-Augustus" did not take on actual reality until his armies in southern Gaul so quickly proved that they could support his theoretical position. With the Ostrogothic victories in Provence and the Narbonensis, and his assumption of the Visigothic regency, Theodoric becomes the outstanding figure in the West. The Vandals are very quick to respond to his chagrin at their support of Gesalic, who is immediately abandoned by all in favor of the grandson of the new Augustus.<sup>38</sup> Clovis, the only possible competitor, with his armies had shown too clearly to the Romans in southern Gaul that he was not the bearer of either Pax or Felicitas Augusta for all of his being an orthodox Christian. Even though Clovis is named Roman Consul in 511 (*consul suffectus* not *consul ordinarius*) by Anastasius, and clothed in the purple tunic and mantle at St. Martin in Tours and given a triumph there, it is an ineffectual ruse on the part of Anastasius. Theodoric controls Italy, Spain, the Narbonensis and Provence.<sup>39</sup> What advantage this honor might have developed for Clovis was negated by his death in the same year.

It is only after 510 then, that Theodoric's prestige has the force to influence the West, numismatically or otherwise. He controls most of it. Only the Franks are a contending force, and they do not

<sup>37</sup> Cassiodorus, Bk. III, Letters 1-4.

<sup>38</sup> Ibid., Bk. V, Letters 43-44.

<sup>39</sup> Hodgkin, *Italy*, p. 351.



control any international commercial center. This is important in considering the impossibility of a Merovingian minted coin influencing the issues of other nations and achieving an international character. On all counts Theodoric alone is in a position to authorize the issue of the VPW tremissis soon after the establishment of peace in southern Gaul in 510. He merits this by virtue of his political, cultural, military and geographical position and his great personal prestige.

This hypothesis is supported by all the evidence accumulated so far, since only with its adoption does the evidence fall into a logical interrelating pattern. Once his generals are victorious in Gaul, Theodoric's sense for organization immediately takes over. Uppermost in his mind is the rehabilitation of these areas that have been ravaged by the recent occupation of marauding fighting armies. A large number of letters in Cassiodorus' file indicate forcibly the rapidity and efficiency of Theodoric's action. He immediately appoints Gemellus as Governor of Gaul and marks him to "... show yourself in all things such a governor as a 'Romanus Princeps' ought to send, and let the province feel such an improvement in her lot that she may rejoice to have been conquered."<sup>40</sup> He informs Gemellus that promptness and integrity are required in carrying out his orders<sup>41</sup> and is attentive himself to appeals from Gallic citizens.<sup>42</sup> The directives are the most telling evidence:

".....our Piety wishes that here should be order and good government everywhere in our dominions but especially in Gaul, that our new subjects there may form a good opinion of the ruler under whom they have come. Therefore by this authority we charge you to see that no violence happens in Avignon where you reside. Let our own live 'civiliter' with the Romans, and let the latter feel that our troops have come for their defense, not for their annoyance."<sup>43</sup>

"Let other Kings desire the glory of battle won, of cities taken, of ruins made; our purpose is, God helping us, so to rule that our subjects shall grieve that they did not earlier acquire the blessing of our dominion."<sup>44</sup>

<sup>40</sup> Cassiodorus, Bk. III, Letter 16.

<sup>41</sup> Ibid., Bk. IV, Letter 21.

<sup>42</sup> Ibid., Letter 12. As a further illustration of this consider the appeal of St. Caesaris at Ravenna.

<sup>43</sup> Ibid., Bk. III, Letter 38.

<sup>44</sup> Ibid., Letter 43.

In his proclamation to his new Gallic subjects:

"Obey the Roman customs. You are now by God's blessing restored to your ancient freedom; put off the barbarian; clothe yourselves with the morals of the toga; unlearn cruelty, that you may not be unworthy to be our subjects.....Do not dislike the reign of Law because it is new to you, after the aimless seethings of the *Gentilitas* (barbarians)..... You may now bring out your long-hidden treasures; the rich and noble will again have a chance of suitable promotion. You may now enjoy what till now you only heard of — the triumph of Public Right, the most certain solace of human life, the help of the weak, the curb to the strong. You may now understand that men are exalted not by their bodily strength, but by reason."<sup>45</sup>

The authority and dignity of these lines herald the coming of the *Victoria Augusta*. They are spoken not by a barbarian but by a veritable Augustus guided by a great, true Roman, Cassiodorus.

Theodoric's sincere intentions for reconstruction and rehabilitation cannot be questioned. He immediately releases from taxation the provincials in Gaul for the period from September 510 to August 511.<sup>46</sup> He concerns himself with the possibility of famine in this area, where as he says: "How can one claim taxes from the lord of a field where one knows he had not been able to cultivate it?"<sup>47</sup> and encourages the shipping of provisions to Gaul by preferential treatment to shipowners.<sup>48</sup> His policies moved to restore the commercial, industrial and agricultural activities of this province as quickly as possible, even if it demanded contributions of his own money, as in the letter to all landowners of Arles: "We wish to refresh men, but to repair cities also, that the renewed fortune of the citizens may be displayed by the splendor of their buildings. We have therefore directed that a certain sum of money be sent for the repair of the walls and old towers of Arles." In this letter he also informed the people of Arles that he had ordered grain to be shipped to them.<sup>49</sup> In another letter he orders that all run-away slaves in Gaul be restored to their masters and thereby sets right one more element

<sup>45</sup> *Ibid.*, Letter 17.

<sup>46</sup> *Ibid.*, Letters 24, 32, 42; Bk. 14, Letter 36.

<sup>47</sup> *Ibid.*, Letter 32.

<sup>48</sup> *Ibid.*, Letter 44; Bk. IV, Letters 5, 7.

<sup>49</sup> *Ibid.*, Bk. III, Letter 44.

60

in the confusion caused by war.<sup>50</sup> In his letter to Gemellus announcing that the "siliquaticum" would not be levied on corn, wine and oil, he states his reasons: "We hope thus to stimulate trade, and to benefit not only the Provincials, who are our chief care, but also the merchants." He also releases all provincials from paying the expenses of the garrison army: "We will transmit to the Duces and Praepositi sufficient money to provide 'alimonia nostris Gothis'."<sup>51</sup>

The outlay of money must have been substantial in the first years of peace (510-512), as they must have been during the previous war years, and an order such as the following does not come as a surprise: "It is the part of true prudence to recall to the uses of Commerce the talent hidden in the earth."<sup>52</sup> When grave digging is authorized to reclaim gold for the state treasury, gold must be scarce and in demand. Gold is needed in the Gallic province to help revive prosperity and peace; to help maintain border garrisons and to pay the soldiery; to cover the loss from the remission of a year of taxes and to pay for the usual expenditures of government. A new monetary issue is distinctly in order, and what could be more appropriate than the VPW tremissis, a perfect commemorative issue for this situation; a most appropriate type to grace a coin that would be utilized for the military payroll. What is necessary for the Gallic province also must have been necessary for the Visigothic territory, for none of the contemporary chronicles consider anyone other than Theodoric as ruler of Spain and the Narbonensis.<sup>53</sup> The same attention to Visigothic lands is indicated in the one extant letter usually dated 523-526, in which he orders his officials to remedy a list of disorders that have been brought to his attention.<sup>54</sup> There is no aspect of government in which he is not in control, and his note to Duke Ida to re-establish certain possessions of the church of Narbonne given to it by the late Alaric II,<sup>55</sup> shows how he maintained control over his officers and nobles even in the Visigothic Narbonensis.

<sup>50</sup> Ibid., Letter 43.

<sup>51</sup> Ibid., Letter 42.

<sup>52</sup> Ibid., Bk. IV, Letter 34.

<sup>53</sup> Isidore of Seville, pp. 282-283; *Chron. Caesaragus*, p. 223.

<sup>54</sup> Cassiodorus, Bk. V, Letter 39.

<sup>55</sup> Ibid., Bk. IV, Letter 17.

If some or all of Alaric's gold was of questionable quality, there would be even more need to begin the new peace with a new gold issue of good quality. It is interesting, if this hypothesis is correct, to question further why Theodoric would not have followed the same fiscal policy in Gaul and Spain that he had in Italy by imitating Byzantine types. Theodoric always conducted himself as King of the Goths and Regent of the Emperor in Italy, observing the limitations which had been laid down by imperial authority.<sup>56</sup> He was always careful to issue only edicts and not laws which were imperial prerogatives.<sup>57</sup> Under him the civil service in Italy remained constant with only Romans permitted in it. It is conceivable that he did the same in the new provinces.<sup>58</sup>

Consequently, Theodoric never put his name on a coin with the exception of the gold medallion and he put his monogram only on some issues. The adoption of Theodoric's policy at Lyons as well as at Narbonne seems probable, not only because of his fiscal policy but also because of the traditions of the Italian mints, the major source of late fifth century gold. Furthermore one of the major pagan centers and imperial mints of the fifth century, Arles, was in his territory, and dies could have been sent from Italy to be copied there if older die designs of the type were no longer in their possession.<sup>59</sup> But if his policy at home was one of relative imitation and subservience to the Byzantine emperor, why was this not followed in the provinces? Is it because in the provinces he and he alone was the power, while in Italy he acted in the emperor's name? The provinces were responsible to him and he to the emperor.

Just as Octavian Augustus and his successors were responsible for the triumphs of their generals through the *Victoria Augusta* so was Theodoric for the victory in Gaul, achieved for him and through him by his generals. The victory of Theodoric's generals also referred back to the Byzantine emperor by virtue of his inheritance of the *Victoria Augusta*. For such a glorious victory accompanied by all the guarantees of the *Victoria Augusta*, the issue of a new coin with


<sup>56</sup> Bury, *Invasion*, p. 207.

<sup>57</sup> *Ibid.*, pp. 199, 207.

<sup>58</sup> *Ibid.* For Theodoric's concern with the maintaining of traditions see the observation of Le Gentilhomme, *RN 1943*, pp. 87, 88.

<sup>59</sup> Ulrich-Bansa, pp. 325, 327-328.

the distinctive VPW type was highly appropriate. It heralded the return of the authority of Rome, now an actuality rather than an illusion of a glorious past. It symbolized the hope for all of the Roma Aeterna. The minting of this coin would have been as appropriate at this time in the Gallic and Spanish mints as it had been in the western mints in the past, when commemorating past and hoped-for future victories of the armies garrisoned in the surrounding areas.

The large quantities issued and their good quality might have forced the Burgundians, for commercial reasons, to mint the same with the distinctive addition of the royal monogram. Those issued by the Ostrogothic Gallic mint would need no distinguishing mark to identify the coins knowingly issued by them. This might explain all monogrammed coins as being other than those issued by Ostrogothic mints in Gaul. The only monogrammed coin attributed to the Visigoths is the  series. Heiss, Mateu y Llopis and Reinhart read this as Amalaric and consequently a product of the mint of Narbonne.<sup>60</sup> Amardel considered this monogram to signify Narbonne and consequently of Visigothic origin.<sup>61</sup> Robert, however, remembered that the Count de Salis had considered these coins to be an Ostrogothic issue struck at the time of their domination of Provence.<sup>62</sup> Le Gentilhomme's thesis that these are Burgundian and the monogram is that of Gundomar seems more acceptable.<sup>63</sup> If the monogram does signify Amalaric, it would have to be assumed that the coins were struck at Narbonne, possibly late in the reign of Theodoric when Amalaric had attained his majority, in order to distinguish the issues of Amalaric from those issued under the regency of Theodoric. Amalaric selects a device perhaps first used by Theodoric to distinguish his bronzes from Byzantine ones. Burgundians later used this device to distinguish their coins from Theodoric's,<sup>64</sup> since in the mind of Theodoric the Burgundians and especially Amalaric were,

<sup>60</sup> Mateu y Llopis, pp. 140-141; Heiss, pp. 77-78.

<sup>61</sup> Amardel, *Les Monnaies à Narbonne*, pp. 133-153; Armadel, *Wisigoths de Narbonne*, pp. 389-401.

<sup>62</sup> Robert, *Languedoc*, p. 115.

<sup>63</sup> Le Gentilhomme, *RN 1943*, pl. IX, 9, 10. Le Gentilhomme reads the monogram as GMA, whereas in accordance with Germanic tradition it should read MAR.

<sup>64</sup> *BMCVOL*, p. XXXI, pl. VII, 6-13.

relatively, in a position to him as he was to the Byzantine emperor. Amalaric was the King to Theodoric's Augustus as Theodoric the King was theoretically to Anastasius, Augustus and Emperor.

There are three possibilities for explaining the origin of the VPW tremissis. The first is that Theodoric and his advisors order a new issue of gold tremisses for the Gallic and Visigothic provinces to aid in their commercial rehabilitation as well as for the payment of the garrison troops. The first coins might have been designed in Italian mints and shipped to Gaul,<sup>65</sup> if, in accordance with old imperial practice, the dies were sent from Rome or another Italian mint along with the bullion necessary for striking the coins; or because of the possible temporary closing of the mints at Arles and Narbonne during the recent war. These coins were then imitated by the mints at Arles and Narbonne on orders from Theodoric, once these mints were able to function. This may account for the few extant coins of this type stylistically attributable to the Ostrogoths. The minting of these at Arles and its commercial importance for the Rhône Valley, Lyons and northern France might certainly have established the precedent for the Burgundian issues and the source for some of the coins in the Alesia and Gourdon hoards. The spasmodic and unsystematic Merovingian issues would be accounted for as random imitations of Burgundian and Visigothic-Ostrogothic issues.

A second possibility is that, when the gold issue is ordered, those to be issued for Visigothic territory and by Visigothic mints are designed to be the VPW tremisses, thereby distinguishing the coins issued by the two different categories of Ostrogothic controlled mints, the VPW for Visigothic and the VGC for Ostrogothic in Italy and Gaul. If this policy was followed, then it would imply that the Burgundians issue a coin similar to those issued by Visigoths under Ostrogothic control, thereby distinguishing their coinage from the more orthodox VGC Ostrogothic coins from Arles and North Italy. Burgundian adoption would not be imitating the Visigothic pieces or have any implication of their subservience to Theodoric. The VPW Visigothic-Ostrogothic issue could have set an admirable model and precedent for them, since they might be asserting their

<sup>65</sup> Kraus, p. 6. Kraus considers Arles as one of Theodoric's mints. Also see Cassiodorus, Bk. V, Letter 39 (Theodoric's orders to Spanish minters).

own victory of 507. The type was common to the mint of Lyons and therefore natural for them to issue again. The Merovingians would still be imitating these coins and continuing to strike them in former Burgundian or other southern Gallic mints that had done so prior to their occupation.

The third possibility has been verbally suggested by Mr. Philip Grierson, that there was a limited issue of the VPW tremissis struck in Rome, perhaps concurrently with the Theodoric medallion, which then was used as a deliberately non-Byzantine type in the Visigothic Kingdom. The type appears in Rome, not only on the medallion and the tremissis, but also on a few extant silver coins which bear the name of Anastasius on the obverse and the VPW and INVICTA ROMA on the reverse, with the letters SC in the field.<sup>66</sup> There is another issue in silver similar to this with the exception of the use of a trophy-bearing Victoria.<sup>67</sup>

Other evidence may substantiate this hypothesis. The conception of the VPW type for the tremissis was in accordance with a developing tradition in Ostrogothic mints. This was also the conception of the Roman Senatorial aristocratic advisors of Theodoric who never lost contact with the Augustan Empire, pagan or not. The possibly commemorative circumstances surrounding the issue of the quasi-autonomous bronzes, the medallion and the tremisses of Theodoric are not unlike the associations that a Roman such as Cassiodorus would again reassert on the unusual Roman bronze series of Theodahad. The king's portrait with tell-tale pectoral cross appears on the obverse and a VPW on a prow in the reverse. Theodahad's entry into Rome in 536 is associated with Theodoric's triumphal entry into Rome in 500. The legend of Victoria Principis even seems to commemorate further Theodoric with Theodahad's hopes that as Theodoric had inherited by personal force the Victoria Augusta now maybe he can inherit the right to Victory from Theodoric, the Victoria Principis.<sup>68</sup> The aged Cassiodorus and the Senate perhaps have resorted to an old idea, since the conception of all of these coins has the quality of an associated policy. The pectoral cross may be even

<sup>66</sup> Tolstoi, II, p. 216, no. 165; Friedlaender, III, p. 56, no. 3.

<sup>67</sup> Tolstoi, II, p. 215, nos. 163, 164, pl. 15.

<sup>68</sup> *BMCVOL*, pp. XXXIV-XXXV, pl. IX, 13-15.

more telling here. It is nowhere else to be found aside from the VPW tremisses and the Justinian Carthaginian bronzes.

We should not underestimate the importance of a symbol, especially that of the Victoria with palm and wreath. She, who was claimed by Octavian Augustus as his very own and who was thereby inherited by all of his descendants, was to grace this coin possibly conceived by Theodoric and his advisors. The Victoria Augusta, the Victoria with palm and wreath, was such an integral part of the politics and religion of the Roman empire, that the last pagan-Christian Romans could not create their new Augustus image in Theodoric without it. So much hope was there in the success of this barbarian king, who better than many before him played the rôle of Augustus, that they had to declare him a descendant of the immortal Octavian and therefore a possessor of Imperial blood.<sup>69</sup> The hope of a new Augustus and the new restored empire in the West was not to outlive him. With Theodoric dies the last hope of maintaining institutions of the old empire intact. The later empire of Charlemagne, the true successor to Theodoric, is a totally different world. The last appearance of the VPW in Rome is an unfulfilled wish with the hapless Theodahad. When the VPW is retired from the currency of Leovigild, it is because she is no longer a symbol of the power of Rome. The only power in Rome is the Pope, and his symbol is the cross. The VPW on the few late issues of the Merovingian Childebert II, according to the Belfort attribution, are anachronistic freaks.

#### B. THE DATE OF THE LAST VPW ISSUE

An attempt to assign a terminal date for the VPW tremissis, particularly the Visigothic issue, is aided by more concrete evidence. The few coins that may be assigned to Childebert I (511–558) or Childebert II (575–595) are too rare and too dissociated from other Merovingian coins to permit an exact dating of these last Merovingian irregular VPW issues. A combination of the monetary reforms of Leovigild, with the coins of Hermenegild, and the Zorita de los Canes Hoard, however, do provide evidence which suggests that the last VPW issue of the Visigoths occurs ca. 579–582.

<sup>69</sup> Cassiodorus, Bk. IV, Letters I, 2; Kraus, p. 79.



Determining factors may be the dynastic and political or fiscal problems of Leovigild, Hermenegild's revolt, the Byzantine occupation and the religious issue. This is based on the coins which bear the name of Leovigild and the few with the name of Hermenegild. Although the latter are so few in number, and of these some are questionable and some definite forgeries, the authenticity of the remainder necessitates their inclusion as evidence.

There are definitely three and possibly four varieties of coins which are struck in the name of Leovigild. The first is the VPW tremissis (PLATE B, 1); the second is the cross-on-steps reverse issue (PLATE B, 3); the third is the facing busts type (PLATE B, 4); the fourth is a variation of the VPW tremissis of the INCLITUS REX design but bearing the name of Toledo instead of the customary legend (PLATE B, 2). This last coin was listed and illustrated by Florez in the late eighteenth century. Although the striking of such a coin is feasible and within the developing fiscal traditions of Visigothic coinage, it has never been recorded as having been seen by anyone else and is unavailable for study.<sup>70</sup> Legends can so easily be misread and misinterpreted, and good forgeries can only be detected through a thorough direct investigation of the material. The use of this coin as evidence, therefore, is very limited.

Miles has suggested the following dates for these coins: the Victoria tremisses of Leovigild between 568–578; the cross-on-steps reverse between 579–584; and the facing busts between 584–586.<sup>71</sup> The date of the cross-on-steps reverse is based on its being an imitation of the tremissis of Tiberius II Constantinus (578–582) which was issued between September and November of 578.<sup>72</sup> This only proves, however, that the cross-on-steps type could not have been issued before 578. It does not necessarily follow that the striking of the VPW issue ceased immediately in 578 or 579. The date of the facing busts is based on the Cordovan issue of Leovigild, which commemorated his second capture of the city in 584, and the crush-

<sup>70</sup> Florez, III, p. 175. Miles (p. 44) accepts this in his *Corpus* (no. 27) but is suspicious of it. Grierson in his unpublished manuscript of the Barbarian coinage in the American Numismatic Society is disposed to accept it.

<sup>71</sup> Miles, pp. 44–45.

<sup>72</sup> *Ibid.*, p. 44. Also see *BMCB*, I, p. 105, n. 2, p. 108, n. 1.

ing of Hermenegild's revolt.<sup>73</sup> Miles further subdivided the VPW issues of Leovigild according to legends and assigned dates to the several groups: (1) the pseudo-imperial issues (those coins with garbled legends), ca. 568–574; (2) Types A–C (Leovigild's name on one face only), ca. 575–576; (3) Types D–G (Leovigild's name on both faces), ca. 575–576; and (4) Type H (INCLITUS REX), ca. 575–578.<sup>74</sup> This chronology and classification implies a progression of consecutive issues, although Miles does not exclude the possibility of simultaneous striking in different mints of several or all of the types. The final stylistic and numismatic analysis in this present study will propose a pattern combining consecutive and simultaneous progressions which, notwithstanding the diverse approach to legend, were contemporaneous products of different mints (See Chart VIII).

A study of the Zorita Hoard determined the chronology suggested by Beltrán. Considering the INCLITUS REX issues as the last form of the VPW tremissis, he dated it from 576/77–580. He placed the Florez coin in 580, and suggested that the new cross-on-steps type was issued to commemorate the Church Council of Arian Bishops held at Toledo in 580, the enactments of which it was hoped would facilitate the conversion of orthodox Catholics to Arianism.<sup>75</sup> The date for the destruction of the Zorita town site as well as for the burial of the hoard has been placed ca. 580.<sup>76</sup> Since, of the ninety coins in the hoard, only three are INCLITUS REX types (one of these is a contemporary forgery) and none are cross-on-steps types, the hoard must have been buried not too long after the INCLITUS REX type was issued and before the cross-on-steps reverse was issued or had had time to circulate freely.<sup>77</sup> Does this suggest that Beltrán's range of 576/77–580 is too long for the INCLITUS REX issue?

Since the Zorita Hoard contains only four or possibly six coins bearing the name of Leovigild, besides the three INCLITUS REX specimens, while it contains sixty-three with garbled legends of the

<sup>73</sup> Miles, p. 45.

<sup>74</sup> Ibid.

<sup>75</sup> Beltrán, *Zorita*, pp. 37, 49.

<sup>76</sup> Ibid., p. 34. Also see *Zorita de los Canes*, pp. 52–54.

<sup>77</sup> *Zorita de los Canes*, nos. 88, 89, 90.

Justin II types, might it be proposed that if the hoard was buried in 580, Miles Types A–G as well as Type H (INCLITUS REX) had not been in circulation for a long time? Or, if they had been, then the issues were rather sporadic and without the control of a central authority, because they do fit into the style groups of coins with garbled legends and are seemingly contemporaneous. The chronologies of Miles and Beltrán should perhaps be qualified if not discarded. The only possible verification for the dating of the VPW with the king's name as early as 575, if not even earlier, is two Zorita coins with legends that might be interpreted as Liuva and Leovigild. The legend of Zorita no. 45 is: ·VATIV· ·ILLI·; VLIVV V·LVA; the legends of Zorita no. 81 are: ICLIVVIO LOIEECIS, IVLIVVIO IVVCVSI.<sup>78</sup> I seriously question the assignment of either to Liuva. If Liuva had ordered his name placed on his coins more should be expected to have survived amongst the large number extant from this period. Although uniqueness is not an unusual characteristic of barbarian coinage, the legends of both of these coins are better explained as transition stages from legends of garbled form to legends bearing the name of Leovigild. If this is so, the Zorita Hoard contains nine coins with the name of Leovigild, including the three INCLITUS REX items. Considering the number in the hoard and the number extant, would a shorter life span be more justified for Miles' Types A–H, i.e., 577/578–580?

Miles' chronology dates Leovigild's first currency reform (the placing of his name on the tremissis) after Leovigild assumes sole rule of the kingdom in 572, on the death of Liuva; and after the successful military operations of 572–575 establish the power of his throne. At the time that he is fighting the Suevians and gradually asserting his power over the entire Iberian peninsula, he orders the placing of his name on the tremissis. Is it at this time also that his increasing power and the pressure of foreign politics also encourage him to invade further on the emperor's prerogative by adopting

<sup>78</sup> The Zorita coins bearing the name of Leovigild are in my Corpus nos. 437 (Zorita no. 45), 474 (no. 83), 475 (no. 82), 477 (no. 81), 539 (no. 84), 540 (no. 85). That the legend of Zorita no. 45 does not read Liuva and is simply a coincidence in the garbled form may be seen by comparing it with the legend of the Zorita item which is no. 439 in my Corpus.

imperial dress, regalia and ceremony?<sup>79</sup> Considering Leovigild's strong dynastic instincts and his policies toward national unity, it is not incongruous that his currency should become more uniform and systematic. The INCLITUS REX issue may present the first attempt to create a uniform national coinage, since its obverse royal portrait was retained for the cross-on-steps issue which has the dignity of a royal portrait, combined with a royal name, and the name of a mint. This coin is now fully comparable to the coins of the Byzantine emperor. Is the adoption of this cross-on-steps type in accordance with Leovigild's political vision of himself as a king, free of any allegiance to the present occupant of the Byzantine throne? If this conjecture is correct, then Leovigild's currency reforms could have been determined solely on secular grounds and have nothing whatsoever to do with the Arian-Orthodox problem or the later revolt of Hermenegild. The evidence of Zorita and the contemporaneity of the adoption of the Tiberius II Constantinus cross-on-steps, however, makes impossible the discarding of Hermenegild's revolt as an encouraging factor in the adoption of the new coin type.<sup>80</sup>

In this regard, Hermenegild's issues must be considered fully in any attempt to develop a chronology. All of Hermenegild's coins are of the same type, with the exception of three, and the authenticity of the latter should be questioned.<sup>81</sup> The remainder, perhaps five in all, are of INCLITUS REX style, but three of these have substituted for the INCLITUS REX legend another — REGI A DEO VITA.<sup>82</sup> The mint at Seville does not issue a cross-on-steps coin for Hermene-

<sup>79</sup> Isidore of Seville, 51 (ii, 288).

<sup>80</sup> For the most recent discussions on the character of Hermenegild's revolt see Goffart, Hillgarth, Thompson.

<sup>81</sup> I accept as authentic nos. 632, 633, 634 and 635. Miles (pp. 199-200) lists these as well as the Johns Hopkins (Miles 47c) and Hispanic Society of America (Miles 46a) specimens which I consider not authentic. Miles also refers to two other specimens which I have not seen, that in the Royal Mint, London (no. 4784) and the other in the collection of Jaime Butiña of Bañolas. The two items no. 636 and 637 in the Barcelona collection I do not accept as authentic.

<sup>82</sup> The authentic INCLITUS REX items are nos. 632 and 633. The authentic REGI A DEO VITA items are nos. 634 and 635, with the possible third one being the now lost item (Miles 47d) which was in the Escorial in 1580. See Miles, p. 200.

gild, or, if it did, none has survived. It has been customary to see Hermenegild's issues as dependent upon those of Leovigild. The mint at Seville, Hermenegild's capital and consequently his mint or one of them, possibly might have issued an INCLITUS REX in the name of Leovigild before the revolt took place and once the revolt commenced adapted this coin for Hermenegild's use. This would seem the perfect moment for Leovigild to adopt the cross-on-steps type in order to distinguish his coins from those of Hermenegild's. As a propaganda device this maneuver has a double thrust, both as a political and a religious weapon. The adoption of the imperial coin, as well as the adoption of the imperial regalia and ceremony, distinguishes the primacy of Leovigild by dynastic right and tradition. He assumes a rôle similar to that of the Byzantine emperor. If Hermenegild's conversion and the Arian-Orthodox controversy are involved in this revolt, the new cross-on-steps type asserts Leovigild's Catholic faith. This might explain in turn the adoption of the REGI A DEO VITA legend on Hermenegild's coins as a counter-propaganda thrust. Is it this legend and its reference to God that suggests to Leovigild and his advisors the CUM DEO OBTINVIT SPALI and CUM DEO ETALICA legends for the first cross-on-steps coins they issue at recaptured Seville and Italica?<sup>83</sup> Is this more counter-propaganda? This is not followed through, however, at Córdoba. At Córdoba, the final victory and the military glory of having twice captured this city take precedence over the protestations of Christian faith and allegiance with God in the legend: CORDOBA BIS OBTINVIT.<sup>84</sup> Only at one other mint, Rodas, does the CUM DEO phrase possibly occur: CVM DI ROPA.<sup>85</sup> If Rodas was involved in the Basque rebellion of 581, this unique legend could then be justifiably used here as it was later at Seville and Italica.<sup>86</sup> The cross-on-steps

<sup>83</sup> See Miles 31a, 31b and 34. Mr. Hilgarth seconds Grierson and suggests that the cross-on-steps type is in retaliation to Hermenegild's REGI A DEO VITA coin, and commemorates Leovigild's victory "...sobre el usurpador católico como un favor de Dios. Sus primitivas leyendas Cum Deo conmemoran los episodios cruciales de la guerra civil, la fortificación de Itálica, la caída de Sevilla." (pp. 45-46).

<sup>84</sup> Miles 30a.-c.

<sup>85</sup> Miles, pp. 85, 185, no. 18.

<sup>86</sup> Thompson, p. 13. Mr. Thompson notes that "...there is no reason to think that the Basques were co-operating with Hermenegild." John of

reverse being struck here in late 581 may indicate that Hermenegild's REGI A DEO VITA had already been issued and that the INCLITUS REX may have already been dropped. The relationship of Leovigild's CUM DEO with Hermenegild's REGI A DEO VITA may indicate a further connection between the revolt of the Basques and Hermenegild.<sup>87</sup> Tactically it would seem best to put down the revolt in the North first, as did Leovigild, since this frontier was flanked by Hermenegild's possible Frankish allies.

In 582, Leovigild retook Mérida, and a cross-on-steps coin is issued with the legend: EMERITA VICTORIA.<sup>88</sup> A non-religious legend is preferred, as it is later in 584, at Córdoba. This might disprove the CUM DEO and REGI A DEO VITA relationship. Another tradition might be at work. The epithets of VICTOR, and PIVS. . . . . VICTOR are found on later issues of Leovigild, Reccared, and Chindasvinth from the mint of Mérida. Add this to the importance of Mérida — AUGUSTA EMERITA — and its Roman traditions which might imply that the EMERITA VICTORIA legend is in compliance with local custom and is more suitable and meaningful to the particular circumstance.<sup>89</sup>

If then the cross-on-steps issue owes its existence to Hermenegild's revolt as counter propaganda, it would be logical for a new type to be issued once the revolt is put down. The facing busts are issued perhaps first at Córdoba in 584, with the legend CORDOBA BIS OPTINVIT and thereby herald at one and the same time the end of the revolt and the removal of the religious question from public propaganda. The combination of the INCLITUS REX profile bust and the cross-on-steps reverse are not to be used again until 653, when

---

Biclar, 581 (ii, 216). Thompson rejects the opinion of Goffart (pp. 91, 105f.) and Stroheker (p. 461), who suggest "...that Leovigild deliberately postponed his attack on Hermenegild so as to give the latter 'every chance to change his mind and repent'." Hilgarth suggests (p. 46) that the Rodas coin dates from 585 and is connected with Leovigild's war against the Catholic Franks as indication of the religious commemorative aspect of the legend. I disagree with the latter dating as being too late for the cross-on-steps type.

<sup>87</sup> John of Biclar, 581 (ii, 216).

■ Gregory of Tours, vi, 18.

■ Miles, p. 119. Mérida was founded by Augustus, ca. 25 B.C. for the benefit of the 5th and 10th legionnaires (Emeriti) of the Cantabrian War.

Reccesvinth becomes sole ruler on the death of his father, Chindasvinth.<sup>90</sup> Does this not suggest Reccesvinth's identifying himself with Leovigild by a coin Leovigild issued at the time of Hermenegild's rebellion? Significant also is the re-adoption of the Leovigild profile bust by Chindasvinth in 649, when he proclaims Reccesvinth as joint ruler.<sup>91</sup> Is this not a direct reference to Leovigild and an attempt to associate dynastically Chindasvinth and Reccesvinth with the earlier "Pater Patriae"? Does this not encourage the acceptance of the idea that the Visigothic kings, like the Roman emperors before them, made propaganda use of the currency, and further strengthen the thesis that Hermenegild's revolt is directly responsible for the Leovigild cross-on-steps issue? The date of 580 may be suggested, therefore, as the date for Leovigild's second currency reform — the cross-on-steps reverse issue. Leovigild's first currency reform, the placing of his name on the VPW tremissis, should be dated before this — but how much before? Could this reform also depend upon Hermenegild's revolt?

In an unpublished manuscript, Grierson also rejects the hypothesis of consecutive issues and suggests a new chronology based on a simultaneous progression and on a reconsideration and re-emphasis of the coins of Hermenegild.<sup>92</sup> He suggests, as has been done here, that Leovigild's first currency reform could have occurred after 578, rather than before, most likely at the time of Hermenegild's rebellion in 579, thereby permitting Hermenegild's issues to be contemporaneous and parallel rather than later. Since Leovigild's and Hermenegild's issues are contemporary, Grierson feels that a better case can be made on behalf of Hermenegild for placing his name first on the coin.<sup>93</sup> Hermenegild's two issues are placed in both a simultaneous and consecutive progression because of the grammatical structure of the legends as well as by the variation in the formation of the letters between the coins in either series. Grierson suggests

<sup>90</sup> Miles, p. 51, no. 353a.

<sup>91</sup> Ibid.

<sup>92</sup> Grierson kindly forwarded me part of a chapter on the dating of Leovigild's coinage from a volume that he is readying for publication which catalogs the barbarian coins in the ANS/HSA collections.

<sup>93</sup> It must be remembered throughout this discussion that Grierson has only *suggested* this thesis.

that the REGI A DEO VITA series is earlier than the REGI INCLITI because the combination of this with the dative form ERMENIGILDI is a correct rendering of the acclamation during the coronation ritual; "(Long) life to the King from God."<sup>94</sup> While on the other hand, "the use of the dative in the other series has no obvious justification, and must be ascribed to a mechanical blending of the dative use of the acclamation coinage with the formula REX INCLITUS copied from the coins of Leovigild."<sup>95</sup> He notes, furthermore, that differences in the forming of the letters R, D and E between the two legends suggests that Hermenegild's coins are issued by two different mints, with the REGI A DEO VITA most likely coming from Seville and the REGI INCLITI from Córdoba.<sup>96</sup> Grierson's pattern is thus that Hermenegild first strikes at Seville the REGI A DEO VITA series, which places his name on a coin that acclaims his coronation. This forces Leovigild to reciprocate, but, done in haste, his injunction to his many mints creates confusion. This accounts for the variety in the handling of the legends.<sup>97</sup> The hesitancy and confusion of the first appearance of Leovigild's name on his coins would signify for Grierson a policy instituted "on the spur of the moment to counteract the possible repercussions of such an action on the part of his son."

<sup>94</sup> This is quoted from Grierson's unpublished manuscript.

<sup>95</sup> Ibid.

<sup>96</sup> Both Goffart, p. 107, and Stroheker, pp. 460, 480, say that Córdoba and its adjacent territory was ceded to Byzantine rule at the beginning of Hermenegild's rebellion in 579. If this is so, it would seem unlikely that the mint at Córdoba would have issued an Hermenegild coin. Miles, p. 24, assigns both of these issues to Seville.

<sup>97</sup> This is a condensation of Grierson's arguments in his unpublished manuscript. Miles (p. 24) gives the correct interpretation of the formula but does not connect it with the coronation *laudes*. Miles suggests that this formula is on Hermenegild's second coin issue and reflects his declining fortunes. This is also my opinion. There is no exact account of the Visigothic coronation ritual. Isidore of Seville (51, ii, 288) says only: "*primusque inter suos regali veste opertus solio resedit; nam ante eum et habitus et consessus communis ut populo, ita et regibus erat.*" Grierson in a footnote in his unpublished manuscript says: "...but the phrase *N...regi vita* is a regular feature of all medieval rituals, which go back to the formal acclamations of late Roman times. The idea of using such a phrase on the coinage came perhaps from North Africa, where *vita* had appeared on the bronze of Carthage in the reign of Justin II, but the practice later spread to Constantinople itself, where *multos an(nos)*, another of the ritual acclamations, was used on the gold of the late 7th and early 8th century (*BMCB*, pp. 99-101, 332, 335, 358 ff.)."



Order is restored by the INCLITUS REX issue. This coin in turn is imitated by Hermenegild's mint at Córdoba.

This suggestion, although provocative, is an inadequate explanation of the numismatic evidence. It is not feasible, as both a stylistic study of the pseudo-imperial issues and an analysis of the Zorita Hoard would demonstrate. Both of Hermenegild's issues are exactly the same design as Leovigild's INCLITUS REX, which is in turn similar to one of the "curru" groups, C 3. Since the "curru" group is of garbled legends, it is presupposed that this may be earlier than Leovigild's INCLITUS REX and Hermenegild's REGI A DEO VITA. Hermenegild has replaced the legends of the "curru" coins with his name and the coronation acclamation. Leovigild takes the "curru" coin and puts the INCLITUS REX legend and his name on it. Why did the mint at Seville select the C 3 coin? Was it because the C 3 was already being struck at Seville at the time of and before the revolt? Or, if its Toledan attribution is correct, was the "curru" coin an already established national coin type standard? The latter seems more probable in the context. It would be improbable for Leovigild to adopt the coin design of the mint of Seville and of his son Hermenegild and continue to use the obverse face in his later cross-on-steps. It would not be improbable for Hermenegild to adopt a coin that his father has established as the official national coin and place his own name on it. When the legends of coins preceding the INCLITUS REX of Leovigild are studied, there is evident a tendency towards standardization, e.g., the regularity of the IVIVIVIVIVIV variables of JII 4, and the "curru" legends themselves. This characteristic is noticeable to a degree on all coins of the Justin II period, and it suggests that Leovigild is systematizing the coinage even before the revolt of Hermenegild. If, then, he is involved in regularizing legends and even type designs as the C 3 suggests, is it not conceivable that other measures such as the placing of his name on the coin be in the offing?

This thesis may gain in stature when Cabré's analysis of the quality of the gold in the Zorita Hoard is studied. Although Cabré does not reveal the source of his information, he has labeled some of the Zorita coins as being of "oro bajo" and "oro muy bajo." A large number of the coins placed in JII 3 are so qualified, but all are

of a regular high weight standard, while a large number of Zorita coins in JII 2 are of a fine quality of gold but of a low weight standard.<sup>98</sup> Cabré's analysis necessitates a qualification of Reinhart's acceptance of all pre-national coinage as being of fine quality, twenty-one carats.<sup>99</sup> The evidence from Zorita adds to the observations made by Grierson in his article on Visigothic metrology.<sup>100</sup> Grierson found that the weights of Leovigild's profile busts suggested that a tremissis of 1.326 gms., or the twenty-one siliqua solidus, is the weight standard in use, a standard widely used in the former western Roman provinces.<sup>101</sup> He also noted that Leovigild's facing busts, as all later Visigothic national coinage, were of 18 carat gold, and that until the reign of Egica (ca. 698) the tremissis was struck with the theoretical weight of 1.516 gms.<sup>102</sup>

The Zorita Hoard reveals that a change in the fineness of the gold and the weight standard was attempted before Leovigild's facing busts issue of 584. Grierson's evidence suggests this when he cites one Leovigild VPW and one Leovigild cross-on-steps as being of sixteen and eighteen carats respectively.<sup>103</sup> None of the Zorita Leovigild VPW's or INCLITUS REX items, however, are labeled as poor gold. This suggests that in the area of weight standards and gold fineness a confusion exists which parallels the confusion in legends, in the "hesitancy" in the use of the name of Leovigild and in the variety of type designs. Leovigild's first reform, the placing of his name on the VPW coin, may be the first step in the direction of a more regular currency. I would suggest that the large number of INCLITUS REX specimens is the last stage in this first reform in which other mints than Toledo strike the coin designed at the major mint, Toledo.

<sup>98</sup> A further illustration of this is found in JII 6, composed of only Zorita items. One of the five coins (no. 529) is not labeled "oro bajo," and its weight is 1.16 gms. The "oro bajo" items (nos. 530-533) weigh respectively 1.38, 1.40, 1.35 and 1.49 gms.

<sup>99</sup> Reinhart, *DJN* 1940, pp. 87-89; Reinhart, *AEA* 1945, pp. 232-233. Reinhart never suggests the change in quality of the gold although he is aware of the change in the weight standard in some of Leovigild's issues. Also see Grierson, *NC* 1953, pp. 83, 84 and Table II.

<sup>100</sup> Grierson, *NC* 1953, pp. 84-85, Tables II, III.

<sup>101</sup> *Ibid.*, p. 81.

<sup>102</sup> *Ibid.*, p. 79.

<sup>103</sup> *Ibid.*, p. 84.

The INCLITUS REX provides the necessary uniform type, weight standard, gold content, guaranteed by the king's name. Although the theoretical weight standard is 1.326 gms., the coin is of 21 carats. The presence of a contemporaneous counterfeit in the Zorita Hoard (Cabr  no. 90) of the INCLITUS REX type may suggest the acceptance of this coin as national currency. Hermenegild's striking of it would present further evidence. The cross-on-steps issue is a second reform in which the name of the mint, lacking on the INCLITUS REX, is now supplied. The type would suggest that this has been motivated by Hermenegild's revolt as well as by his striking an INCLITUS REX coin. The facing busts is a third reform necessitated by possibly two causes, the end of the revolt and the economic necessity of legally debasing the coinage. The theoretical weight is raised to that of a Byzantine tremissis, but the gold content is reduced from twenty-one to eighteen carats. The difficulty in maintaining the twenty-one carat standard may be suggested by the existence of some cross-on-steps coins of eighteen carat gold as noted by Grierson.<sup>104</sup>

It is more feasible to conceive of this fiscal reform developing gradually and naturally under the guidance of Leovigild. Hermenegild's reaction to Leovigild's cross-on-steps which must have stolen Hermenegild's orthodox "thunder" caused Hermenegild to continue striking the old coin but with a countering religious legend, REGI A DEO VITA. Did he need to bring the religious question further out in the open to gain supporters, particularly after the conciliatory measures adopted by the Church Council of Toledo (580)?

Can any evidence be gleaned from considering the number of the coins extant within the Justin II and Leovigild groups? Of the two hundred forty-one coins of Justin II studied, one hundred twenty-five bear garbled legends, seventy-three are "curru," twenty-two bear the name of Leovigild, and twenty-one are INCLITUS REX. Miles' catalog lists thirty-eight cross-on-steps and eighty-four facing

<sup>104</sup> Ibid. Grierson suggests "...that 18 carats was the fineness which Leovigild ordered that his gold coinage should be." Grierson (p. 84, n. 17) notes that: "Hermenegild apparently reverted to the full imperial standard, for the one specimen of his coinage in the British Museum has a density of 19.08, and a fineness therefore of 98.5." This may be a correct observation, but the evidence of one coin is not sufficient.

busts. The garbled legends may extend over the thirteen years of Justin II's reign, 565–578; the "curru" series may fall between 573/574–578, as issues of Leovigild, first struck at Toledo and then perhaps imitated by one or more mints in a preliminary move to standardize the coinage; the JII items with the name of Leovigild may date just before or just after the death of Justin II (ca. 577/578), again in response to the royal attempts to standardize the coinage.

The death of the emperor in the East may have been a perfect opportunity to permit the first great step in placing the name of Leovigild on the coinage, particularly when all the evidence points to a gradual recognition of the necessity to establish a more uniform currency. The INCLITUS REX should date soon after, ca. 578/579–580, adopting the "curru" style which may already have been promoted by the mint at the capital, Toledo, and enjoining other mints of the state to strike this in place of their local issue with the name of Leovigild (Miles' Types A–G). Hermenegild's REGI INCLITI must date from the beginning of his revolt in late 579 or early in 580, with Leovigild's cross-on-steps, and his own REGI A DEO VITA following closely behind in late 580 or early 581. Leovigild's cross-on-steps continued to be struck until 584, when it was replaced by the facing busts (584–586).

The stylistic evidence described in the following chapters will bear out this chronology which reveals Leovigild's enlarging image of himself as an independent king, possessing all of the prerogatives, the regalia, and the "uniform" of the Byzantine emperor. The death of Justin II may have permitted the final outward demonstration. This self-image also permitted the establishment of Hermenegild, the heir apparent, as DUX at Seville in late 579. Leovigild was truly an INCLITUS REX.

## DETERMINANTS FOR STYLISTIC ANALYSIS

Hypotheses have been established in regard to the provenance, the significance, the initiators, the minters, and the dating of the VPW tremisses. What remain to be studied are the coins themselves, and they must be organized into categories which will resolve specific problems of dating and attribution.

The placing of the coins into a workable order demands finding some consistent pattern that will provide or suggest a means by which groups may be collated and sequences organized. An analysis and tabulation of the legends, of the weights, and of the gold content might provide the means of analysis, yet cursory efforts in such investigations seem to complicate and confuse rather than to clarify the issue. We do find possibly more solid ground in uniting these factors with a study of the style of the coin types, the imperial portrait, and the striding Victory.

The use of the information in the obverse legend, the only definite factual material on most of these coins, may be used only in a subsidiary way, since there is no guarantee, at the outset, that the imperial name has anything to do with the date of coin. We have coins bearing the names of Anastasius, Leovigild, Theodebert I, Childebert I (or Childebert II according to Belfort), Justin and Justinian. There is a large number with consciously garbled legends and a series bearing the puzzling legends: CVRRVI CVRRVI; CVRVVVTI MVRVIVC; or variations of the same. The coins that might be read as Justin do not indicate which Justin is being referred to, Justin I or Justin II. Furthermore, it is often difficult to distinguish the legends of a Justin from those of a Justinian.

Any stylistic study of these coins must proceed first by understanding mint practices in the late Empire and then by considering three stylistic determinants. Since the coins of Anastasius establish the early terminals, it is necessary first to consider the aesthetic values upon which the imperial tremissis is based. If we accept the fact that the barbarian imitations are the products of continually

producing provincial mints, late fourth century issues of Western mints must be studied. A positive, known factor, the style of Visigothic national coinage, must be considered since it represents the final stage of a long development whose origins and paths of development are conjectural.

The ascendancy of the symbolic and abstract interpretation of coin types in the late Empire may be traced to the expedient measures adopted by the mints as well as the influence of both Christian and barbarian aesthetic values. The reforms of Diocletian inevitably created a confusion in the presentation of the obverse portrait bust and legend. Unavailable die models for a new emperor might necessitate the use of the deceased emperor's bust with the legend of the new emperor.<sup>1</sup> The consequence of the division of the provinces between Augusti and Caesari placed mints under several possible jurisdictions, with each mint continuing to issue coins in the names of its Augusti as well as his co-regents with or without the corresponding busts, so that the emperor's name could be placed around the portrait of his co-regent.<sup>2</sup> What develops is a symbolic rather than realistic relationship between portrait and inscription. One or more conventional portrait bust types begin to take shape by the late fourth century. The break-down in centralized controls and the consequent increasing independence of the various localities encourages this development in the fifth century. The confusion of the era and the insecurity of the imperial office might have necessitated the development and retention of a recognizable conventional effigy for commercial reasons as well as for the expediency of the minters.<sup>3</sup>

Design variations from mint to mint and within a mint are determined by a number of factors. Mints did keep old die designs and must have kept records of previous issues. Only this could explain the issue of contorniates commemorating the tercentenary of the death of Augustus and Nero's Victory issue, with the reintroduction

<sup>1</sup> Maurice, p. 4.

<sup>2</sup> Ibid., pp. 5-6. Also see Pearce, *NR 1946*, pp. 61-62 and *RIC IX*, p. xi. Mattingly, *Roman Coins*, p. 234 gives the best and briefest picture of the change in style and the "growing barbarism."

<sup>3</sup> *BMCB*, I, p. lxxxviii.

of Aes coinage in which Nero's coin types were used.<sup>4</sup> The possession of old dies may account for the surprising reappearance of coins of better and earlier imperial style after the complete breakdown of that style in the late Empire.<sup>5</sup> More important is the possibility of the reworking of old dies such as those noted by Alföldi in the Constantinian Solidi of Ticinium.<sup>6</sup> Alföldi states that the wearing out of the hubs from which the obverse dies were produced led to a less distinct portrait, and that the copy of such inferior types thus occasioned the appearance of a new type of portrait.<sup>7</sup> He also noted modeling lapses which gradually geometricized the portrait; the nose outlined by a contour line, the eyebrow emphasized by a row of dots, and the changes in facial proportion. This practice is most evident in fifth century coinage and may be the *modus vivendi* for the developing style of Visigothic coinage. The uniformity in a coin issue designated dictation from a central source, but variation in type style indicates the possibility that the local mint copied the "example" coin sent from the imperial treasury for purposes of imitation.<sup>8</sup>

The practice of the "Monetae Publicae" in which private gold was converted into solidi, since minting of state gold was limited to the imperial residence, would not produce coins of the controlled quality of imperial mint issues.<sup>9</sup> The use of local goldsmiths outside

<sup>4</sup> Grant, *Anniversary Issues*, p. 155. Vermeule, *Num. Circ.* 1952, pp. 356-357, gives further corroboration of this practice.

<sup>5</sup> E.g., Coins of the JII 3 group. Also see Kent, pp. 200-201.

<sup>6</sup> Alföldi, *JRS* 1932, pl. III.

<sup>7</sup> Ibid., p. 17. Vermeule, *Num. Circ.* 1956, provides the following characterization of the late Constantinian style which he states continues to the time of Justinian I: (1) a constant appearance of diadem and rope-like hair arranged in neat lines over the brow and behind the ears; (2) always a flattened view of both shoulders with, as the century advances, increasingly angular drapery over the cuirass; (3) a usually beardless face which is flat, linearly defined around nose, eyes, and mouth in keeping with its relationship to the background; and (4) the portrait is so dematerialized and made so impersonal that only a trained eye can tell the actual portraits of one emperor from another. Vermeule also notes that, through the fifth century, reverse types also develop a more linear costume, a more denaturalized form while they lose the vigor of personal representation and demonstrate an increased interest in decorative pattern.

<sup>8</sup> Maurice, I, p. XXVII.

<sup>9</sup> Kent, pp. 200-201.

the mint atelier also provided for a variety of style and less control of the purity of the design. It further increased opportunities for counterfeiting. Maurice considers this system responsible for numerous style variations and counterfeiting at both Lyons and Trier.<sup>10</sup> Such weakening mint practices would tend to increase rather than decrease during the crises of the fifth century. Those mints controlled by the various barbarian kingdoms in the fifth century, therefore, would make their new dies by copying imperial coins or by reworking old die designs in their own workshop. The loss of imperial centralized control, furthermore, would have necessitated the increase of private minting of gold by local goldsmiths, a situation that could have created a stylistic chaos.<sup>11</sup> These aspects are already evidenced in products of the mint of Lyons as early as in the Constantinian Era<sup>12</sup> and are certainly indicated in those late fifth century tremisses assigned by Ulrich-Bansa to the mint at Milan.

Before considering the stylistic treatment of some late fifth century western tremisses, it would be appropriate to consider the design standards of the mint of Constantinople. On an imperial tremissis of Anastasius (PLATE A, 2), the treatment of the profile bust has reached that point in its stage of development, where the effect of reality is not completely evinced by plastic modeling. Line already is being used to emphasize and differentiate contours. The modeling is not of the subtle naturalism as that of the head of Augustus four centuries earlier. It is not even so finely understood as it is on the coins of Arcadius from Constantinople. By the time of Anastasius, modeling is treated almost as a simple mass which is raised slightly from the surface of the coin, and upon which line is then used to distinguish the mass as a head. This is particularly seen in the treatment of hair, which is all in line.

The die maker still had a three-dimensional sense of relationships, however, for he did not reduce the contour of the back of the head or the contour of the neck or the lower jaw to a line, but distinguished these areas by an adjustment in the surface relief. Modeling such as

<sup>10</sup> Maurice, I, p. 372; II, pp. 65-66.

<sup>11</sup> Note Theodoric's edict against this, Cassiodorus, Bk. V, letter 39; Bk. VII, Formula 32.

<sup>12</sup> Maurice, II, pp. 65-66.



is used here does not seem to be sufficient for the artist. He enhances the facial features by sharper lines that give the appearance of being extra additions of gold to the surface: e.g., the sharp line of the forehead and nose; the heavy outlining of the eyebrow, the eyelids, and the tiny globules for the pupil; the globule for the nostril; and the lines which achieve the fullness of the lips. By means of such linear effects the artist attempts to distinguish between the various planes of the face and the individual features. The folds of the paludamentum also are completely flat and executed in line. There is no modeling to create the three-dimensional sense of fullness, merely the two-dimensional sense of outlines.

There is an attempt to show almost a frontal chest with the profile head instead of the three-quarter view as found in other tremisses (PLATE A, 3). This may be significant in revealing the possible origin for the circular fibulae on the shoulders of the bust type, as seen in Leovigild's coinage. Where the fibula appears on one shoulder, on the other is a rough curved area that marks the upper sleeve above the pleats. This latter area treatment may be imitated later as a fibula on the left shoulder, similar to the fibula on the right, particularly when directed by an aesthetic viewpoint which is concerned with symmetrical repetitive arrangements.

The Victory figure on the reverse of this coin is achieved similarly by the simplest treatment of modeling. It is a raised mass, with patterns of line added to distinguish arms, wings, head, torso and drapery. The vertical linear folds stand out but are still contained within the contour lines of the dress. If you ignore the sense of the mass of the entire figure, you see the linear aspects which make up the later Visigothic Victory figure. For such delicate work the artist has abandoned modeling to achieve the distinction between parts of the head. An unbroken line frames the contour of the head from the top of the nose to the tresses of hair that rest on the back of the neck, and dots of gold distinguish eye, chin and lips. It readily may be seen how the misunderstanding and misinterpretation of three-dimensional modeling and linear additions by barbaric imitators or perhaps more accurately, later provincial craftsmen working under barbarian governments, produce the abstract two-dimensional types found in Visigothic coinage. Perhaps the imitations were based

on worn imperial coins, for the wearing down of a modeled mass does take on an increasingly linear aspect. Distinguishing naturalistic details are gradually lost.

This should not be interpreted as signifying the degeneration or barbarization of this type. The final Visigothic type must be understood in relation to the aesthetic values of these people. Their art was never expressed in three-dimensional plastic forms. They had a feeling for decorative, moving, geometric flat patterns. Their designs are purely abstract or animal and nature forms abstracted and combined in total moving patterns. This was the basis of their aesthetic, far removed from an art based on classic values and not unlike the developing aesthetic of the new Christian era. As a result of this taste, craftsmen would gradually lose the knowledge of the necessary small tricks of the trade that gave one an illusion of a three-dimensional form.

Or, perhaps more precisely, craftsmen would tend to simplify the design of the types, which does not necessarily imply a loss in skill. Certainly the evidence of the development of the coinage indicates a conscious gradual transformation from realism to abstraction.

A further factor, often forgotten, is the decidedly iconoclastic propensity of the early Spanish Church and its ties to the Levantine shore of the Mediterranean. The Council of Eliberri (Illiberis, Elvira, Granada) in the early fourth century decreed: "Placuit picturas in ecclesia esse non debere, ne quod colitur et adoratur, in parietibus depingatur." This could account for the rare appearance of the human form in early Spanish Visigothic art. The few examples that are extant date almost completely from the last third of the seventh century.<sup>13</sup>

<sup>13</sup> Helmut Schlunk, *Observaciones*. Extant fragments of figure representation in sculpture are as follows: 1. Byzantine sarcophagi from the late fifth century from Ecija y Alcandete, Briviesca, Itacio and Orviedo; 2. Evangelist capital at Córdoba; 3. Pilaster fragment in Almonasta; 4. Fragment of a "pila" in Toledo; 5. Remains of a capital in Córdoba. Architectural monuments in which figure relief sculpture is found are San Pedro de Nave, Santa Maria de Quintanillas de las Viñas and San Juan de Baños. All of these date most likely from the late seventh century. The iconoclastic injunction is to be found in Canon 36 of the Council of Eliberri. See Schlunk, *Visigodo*, pp. 212, 233-323; Garcia y Villada, I, p. 311; and Palol de Salellas, p. 104.

Tremisses of Justin I and Justinian II show the continued progression from three-dimensional plastic form to that of two-dimensional linear elements. The coins of this period present a more limited geometric cast and a greater simplification. The soft roundness of subtle classic modeling is being replaced by an angular geometry of flat patterns (PLATE A, 3, 4).

The immediate sources for the style of the barbarian coins must be found however in the local mints of the Western Empire. The complex problem of separating the coins of one barbarian group from another is due largely to their similar origin. We know that from the time of the reign of Zeno there was an increasing production of tremisses in the West, which could come from the non-barbaric mints of Rome, Ravenna, Milan and Arles, or also from the barbaric mints of at least Lyons and Narbonne, if not more, e.g., Toulouse, Bordeaux and Trier.<sup>14</sup> Unfortunately the major tremissis type, the cross-in-wreath reverse, does not bear any mint identification marks, and, consequently, like the later barbarian issues, can only be attributed by style. Ulrich-Bansa has accredited the mint of Milan with most of the tremissis issues as well as the silver functions of *siliquae* because he conceives of Milan as the production center of coins for the marginal regions.<sup>15</sup> He is able to attribute some of the tremisses because of their stylistic relations to the silver coins which bear the mint mark of Milan.<sup>16</sup> The connection of these is undeniable, although Ulrich-Bansa himself comments on the variety of styles and legends within the tremissis group which he associates with these.<sup>17</sup> The variety might admit non-Milanese issues in the group, perhaps some from Arles.

The existence of these numerous coins in the name of Zeno and traced definitely in part to Milan, and indefinitely in part to Milan and the region of Northwest Italy or Provence, places them in the locality immediately adjacent to the provenance area of most Anastasius VPW tremisses. The stylistic connection is indubitable. It must be from coins of this type from Milan and possibly from Arles

<sup>14</sup> Ulrich-Bansa, pp. 327-328.

<sup>15</sup> Ibid., p. 337.

<sup>16</sup> Ibid., pp. 338-339.

<sup>17</sup> Ibid., p. 340.

as well that the VPW tremisses of Anastasius depend. Ulrich-Bansa considers the most active period of the mint of Milan to extend from 476 to 488, when activity at Rome is negligible; that of Ravenna is very limited; and commercial needs in the West force these tremisses and siliqua issues. Ulrich-Bansa does not attribute any Anastasius tremisses to Milan although he admits the possibility.<sup>18</sup>

Coins in the name of Zeno which have been attributed to Milan, consequently, must be analyzed. The best of the Zeno tremisses attributed to Milan or genuinely western mints still maintain a plastic three-dimensional quality in the conception of the profile bust. This plastic sense extends beyond the modeling of the head and facial features and involves the successful suggestion of the three-quarter chest pose.<sup>19</sup> The disintegration of this modeling refinement is quickly noticeable in the flattening chests of no. 181 (PLATE C, 4) and its variables as well as nos. 176, 185 (PLATE C, 1, 9). The chest is approaching the two-dimensional geometric shape of the later barbarian issues, although here no abstract pattern has been evolved. The die makers, inept when working on a small scale, have a realistic prototype in mind and so create only a symbolic confusion of parallel, curving, and perpendicular lines for the rich folds of the paludamentum. In no. 181y (PLATE C, 6) the final C in the obverse legend can almost be confused with the second circular brooch of the later Visigothic issues. The heads vary considerably in refinement of modeling and facial features. In the best the face, headdress and diadem all combine to form a unified whole delicately and ably conceived (nos. 177, 179; PLATE C, 2, 3). In others, the geometricizing of the design is already taking shape; contours become more emphasized at the expense of the accuracy and refinement of the modeling. The nose and lips and chin are stressed, with also the glob for the eye causing the cheek and jowls of the head to protrude inordinately, e.g., nos. 182, 183, 185 (PLATE C, 7, 8, 9). The tendency to emphasize and clarify details of the delicate scale of the portrait tends to distort and departmentalize, e.g., in the treatment of the diadem in nos. 181, 181a, 182 (PLATE C, 4, 5, 7) where the headdress is divided into a "juliette cap" back of the head, and the frontal

<sup>18</sup> Ibid., p. 345, n. 37.

<sup>19</sup> Ibid., pl. XV, 177, 179, 180, 183.

bangs cover ears and forehead. What we are witnessing here is the gradual breakdown in the classical value system and a change in imperial taste. This change is occurring even in an Italian mint with a long classical tradition. The conceptual difference between these and the later barbarian tremisses is the more realistic, aesthetic orientation of the former imperial mint makers. This prevents them at this stage from developing a truly abstract symbol.

The stylistic variation between these coins of Milan and earlier ones of Lyons, Arles and Trier from those of Rome and Byzantium could already be ascertained in the late fourth century issues of Valens,<sup>20</sup> and even earlier in those of the Constantinian Era.<sup>21</sup> There is a tendency in the fourth century for the coins of the Gallic mints to be closer in style and technique to each other than they are to Italian or eastern mints, and respectively they are closer to Italian issues than to those of the East. Yet in the late fifth century, with the moving of the prefecture of Gaul to Arles, the Italian mints must take a larger share in the responsibility of coining gold for the western provinces. A more local and regional style may possibly exist between North Italy and South France at this time than ever before. Ulrich-Bansa may be correct in seeing Milan as the center of western mint operations at the end of the century. On the basis of the stylistic evidence this would certainly be true. If we accept Keary's theory that as the fifth century progressed, gold from the East was used much more in northern Gaul while southern Gaul, Africa and Spain continued to use the money of the West and Italy, we may be able to justify the similarities of the Carthaginian bronzes of 534 with barbaric issues in the West and establish a stylistic basis for a western regional style.<sup>22</sup>

The relationship between Carthaginian silver and bronze and the barbarian tremisses indicates a common heritage (PLATE A, 7, 8, 9). The bronze follis shows a similar departmentalized treatment of the head as found in a type of Justinian coin, such as no. 254 (PLATE XII). The frontal chest of the follis even has the central compartment which bears the cross (or in some examples the chris-

<sup>20</sup> See the illustrations in *RIC IX*.

<sup>21</sup> Maurice, I, pls. V, IX, X; II, pls. VII, VIII, X, XII.

<sup>22</sup> Keary, p. 58.

mon).<sup>23</sup> The silver votive pieces parallel the style in which the emphasized diadem almost does away with the forelocks and bangs. Coins no. 315 (PLATE XV) and Miles 374a (Reccesvinth-Emerita) may be later stages of this style.

The Ostrogothic coins which naturally descend directly from those fifth century Italian mints previously mentioned are of more consequence. Theodoric's Anastasius issues are the closest in the West to the imperial coin in excellence and refinement of technique, although the Ostrogothic versions are more conscious of line, and a line executed in a very high relief. These aspects are especially true in regard to the two VPW tremisses attributed to Rome by Wroth.<sup>24</sup> They have done away with representing the ear by simply extending the forelock down the entire side of the face. The only important area of modeling now is of the chin, jaw and cheek bone, which distinguishes that area from planes of the neck and the profile hollow of the meeting of the eyes with the bridge of the nose (PLATES VI, 130; VII, 131). What has been said in analyzing the imperial Anastasius coin may be reiterated here. The design of these is even simpler than the imperial ones and those from Milan in the time of Zeno. Two variant types are found. The first is a typical striding Victory advancing right, and the second is a Victory posed to the left on a globe. Both are connected with Gallic and Spanish striding Victories, for the treatment of the legs of the Victory on a globe has accentuated the striding pose by hiding the taut leg under drapery and revealing the left leg advancing forward. This particular coin already shows the first stage in the development of the late Visigothic insect Victory in the treatment of the drapery folds of the chiton. Note how the garment has lost its bottom hem line, thereby permitting the drapery folds to operate freely like ribbons, ribbons which will develop later into extra legs or appendages in back and front. This is a particular design aspect seen earlier in all Victories standing on globes rather than in the striding positions. It is also seen in frontal Victories standing on a globe or striding.<sup>25</sup> The mints that produced these may very well have set prototype precedent in

<sup>23</sup> *BMCB*, I, p. 65, nos. 361, 364.

<sup>24</sup> *BMCVOL*, p. 56, nos. 71, 72, pl. VII, 3, 4.

<sup>25</sup> *Ibid.*, pl. VII, 1 and 22.

the West, particularly supported as they were by the prestige of Rome and Theodoric. Coins from local and western mints are the ancestors of the barbarian VPW tremisses and not coins or dies from the East.

Finally the style of Visigothic national coinage which is governed by certain absolute values must be considered. Since the type plays so important a rôle in the early coinage of Leovigild, one is hopeful that the real answer to the attribution problem lies here rather than in the few nondescript coins of Theodebert I and Childebert I or II. Visigothic coinage is a coinage in which commercial standardization supports the continuance of recognizable symbols achieved through the simplest means. Not only are letters punched, but the punches, wedge-shaped, circular, and "C" shaped, are even used to create the types, a practice particularly noticed in the time of Swinthila and Sisenand.<sup>26</sup> The technique and the aim are those which progressively achieve a more developed abstract reality. It must be granted that the types produced are therefore more of the character of symbols than of individual portrayals of the king. The variety of these symbolic forms in any one reign are more apropos of an elected kingship and the lack of the establishment of a strong dynasty. This is further apparent in that in certain periods one standard representation of the profile bust is regulated. This is seen with Leovigild and attests to his own strong position. It is later seen with Chindasvinth and Reccesvinth who reissue the Leovigild type. Their political gesture may be an attempt to establish a dynasty and identify it with the greatest of Visigothic kings, Leovigild, who had made a similar effort.

There is also a sense of compositional order and clarity, which continues some of the quality of the coins of the early empire. The relationship of the parts to the whole is always clearly maintained. Neither legend nor type usurps the other's territory, each retaining its identity.

There is a sense for flatness and two-dimensional emphasis on line. They prefer to see a figure as design rather than as a three-dimensional modeled form. This, as has been mentioned previously, is in keeping with all extant fragments of architectural sculpture of this

<sup>26</sup> Miles, p. 151.

period and is a constant element in Spanish art. The Spanish sense for strong flat patterns of color areas and design is rarely infringed upon by their desire for realism.<sup>27</sup>

These, then, are the absolute values which are the result of the stylistic development of the sixth century. They are quite distinct from stylistic attitudes in Merovingian coinage, where a greater variation in technique and bust types prevails because of local rather than royal control of the mints. The individual differences in Visigothic mints are displayed within a narrower range of controlled possibilities. A much more conservative, vigorous and disciplined dependence on traditional style or type is the basis of the creative impulses of the Spanish Visigothic mint.

<sup>27</sup> Consider the cubism of Picasso, the naturalism of Goya, and the flatness of Velázquez in his treatment of light. This change from a Roman to a Mediaeval aesthetic cannot be simply explained by their inability to do better. Before the inability does develop there has been an aesthetic change which dictates a form consciously away from a realistic expression. Naturally with an aesthetic based on the symbolic representation of the natural world, the techniques necessary for realistic depiction are lost. Mediaeval craftsmen create a meaningful expression within theologically established limits. Conventions and formulas govern their aesthetic discipline and aesthetic choice. They cannot create a realistic form because they do not want to nor does society want them to. It is to be noted that realistic forms in the 14th century appear quite readily once the aesthetic and cultural attitudes of artists, theologians and patrons desire a more realistic expression.



## THE ANALYSIS OF GROUPS

Between the poles of the attributable late fifth century and anonymous imperial issues and the late sixth century national coinage, the anonymous VPW tremisses must be arranged in a logical order to demonstrate the transition from Roman imperial coinage to that of the first mediaeval national states.

The VPW tremisses of the major collections have been organized into stylistic groups from Anastasius to Justin II. Each group has been analyzed first for consistencies of weight and legend and second for relationship with other groups. It has been found generally that most of the VPW groups have a stylistic connection with each other and particularly with the late Leovigild and so-called national Visigothic coinage. Most of the groups are associated with sub-groups, e.g., A 1 and A 1a. These sub-groups are distinguishable from their parent body for diverse reasons. Some are composed of stylistic variants which may or may not imply that they are not of the same mint, or are from an unofficial mint within the same locality, or are imitations by the mint of a different barbarian group. Others are listed as variables because, in contrast to the main body of the group, these coins bear letters or monograms in the obverse or reverse field, and this too may or may not imply a different mint product, either of the same nation or of another.

On the basis of style, the coins may be classified chronologically, since the general standard that is maintained throughout this pre-national coinage is first seen in the Anastasius tremisses. The Anastasius issues also present the basis for the varied directions that the abstraction of types will follow down to Leovigild.

### GROUP A 1 (PLATE I, 1-20)

In the coins of this group both faces present the initial stage of later stylization. The profile bust (PLATE I, 1) begins with an un-

modeled chest on which only the drapery folds have been handled as line. There is an over-all sharpness of line which emphasizes the nose and eyebrow, the diadem, the bow-strings of the diadem (infulas), the pleated sleeves and the fibula on the shoulder. The mass is relegated to the head and neck alone, with the greatest density around the neck, jaw, and upper cheek. The whole effect is softened by strokes of hair falling like bangs, framing the face and covering the ears. The striding Victoria has developed much further along the lines of abstraction. The flaring folds of her light skirt now appear like fluttering ribbons; her gown no longer has a solid bottom hem to keep all the drapery folds confined within the contour of the dress. Her later insect appearance is beginning to take form. Her head and wings are still carefully modeled. The upper part of her chiton is taking the shape of the truncated pyramid.

All this is closely repeated in the coin (PLATE I, 3), with the addition of a cross squeezed in beneath the folds of the emperor's paludamentum. The insertion of a cross has the look of an after-thought, of a sudden change on the die. It rests like a medallic brooch against the chest. In the coins (PLATE I, 9, 10) the sharpness of the styling has increased, and the pectoral cross has moved its position to the top of the head in the midst of the legend.

The portait bust (PLATE I, 9) becomes more stylized in the next coins, wherein the head becomes more linearly departmentalized into the three zones, back of the head, diadem, and front framing bangs. The fibula fills the area of the shoulder above the pleated sleeve. There is a similarly increasing simplification in the Victory type, which seems to be the first stage in the insect Victory development.

The legends of these coins and the form of their inscription are similar. They read DNANASTA SIVSPPAVC on the obverse, with the exception of those that include a cross in the legend at the top of the portrait bust, DNANASTA + SIVSPPAVC, and those which bear the legend, DNANASTA SIVSPFAVC. The reverse legends generally read VICTORIA AVGVSTORVA, although the difficulty in reading the last letter of the second part of the legend may result in variations such as AVGSTORVN or AVGSTOVAI. The weights are fairly consistent, ranging from 1.465 to 1.55 gms., and only in the sub-groups are two coins found to be as low as 1.395 and 1.43 gms (See Chart X).

Their style, weight, and legend indicate that these tremisses are possibly the earliest in the Visigothic issues. The developing lines of abstraction do not interfere with the sense of order or clarity of the total design while they do reduce the classic form to a linear angular pattern.

*A 1a*

(PLATE I, 21-25; PLATE II, 26)

Both legends and weight are in accordance with the main group, as is the design style in most respects. Yet, there is a slight variation in the handling of the diadem », which is close to, though not so exaggerated, in coins we identify as Burgundian and which Wroth had assigned to the Vandals.<sup>1</sup> The Victory figure, however, is in direct accordance with the developing six-legged type.

*A 1b-A 1h*

(PLATE II, 27-36)

These all bear stylistic affinities with the Visigothic group but with distinguishing letters in the field. Some bear closer resemblance to the group than do others in regard to style, legend and weight. All evolve around the main type of the group, however, whether or not they are Visigothic.

*A 1i*

(PLATE II, 37)

This single coin is a possible variable which is difficult to place. It bears a resemblance to some coins of Group A 2. It is not a usual combination of obverse and reverse type styles.

*A 1j*

(PLATE II, 38-41)

These coins represent a late stylization of A 1 and reveal their proximity to the style of A 3, indicating the possible lineage of A 3 from A 1.

<sup>1</sup> See the coins of Group A 7 and *BMCVOL*, p. 10, nos. 2-9, pl. II, 7 and 8.

## GROUP A 2

(PLATE II, 42-45)

The first and possibly prototype coin of this group presents a finely modeled realistic obverse portrait with a much less naturalistic Victoria. A delicate technical refinement characterizes the four coins assembled here, with an attention to facial features and headdress. This carries through into the more stylized and more linear coins in the Cabinet des Médailles, where details are delicately pinpointed.

The realism of the die cutters has made an adjustment in recreating the striding Victory, which has maintained her human two-legged form, but she has lost the flaring drapery folds in the back of her skirt by having them joined to her wings. The front drapery folds are two appendages but tightly connected to the bottom of the dress. The whole effect is that of a triangle with a concave base. The wings are expertly modeled to suggest feathers, and the nose and headdress of the little Victory are discernible. All these features have been maintained in the more stylistic Paris items but with an obviously less aesthetic substitution. The result is a more fluid design for the awkward, more realistic figure, so that Victoria does advance and stride.

*A 2a-A 2c*

(PLATES II-III, 46-64)

The solid, round, classically modeled head of A 2 again appears in yet a different and possibly later format. The chest type resembles those of A 4a and A 4b. The Victory figure presents that of A 2 in a more stylized version until in some examples (PLATE III, 52) the chiton has become so small as to be almost non-existent, and only a stick figure remains. Even with this stylization there remains the same kind of design feeling, as seen in the Victories of A 2. The developing left shoulder vertical pleats are suggested in A 2, but are here well established.

The legends and weights of A 2a are fully in accord with those of A 2, and the entire group continues the standard seen in A 1. The stylistic variation of A 2b (PLATE III, 56-59) maintains the weight

standards as well as the legends of the group. The variation in the reverse legend of A 2c (PLATE III, 60–64), *VICTORIA ACUSTO*, suggests the later legends seen in such four-legged Victory groups and in JAN 5. The surprising barbarization of the obverse legends in the London and New York pieces makes it difficult to consider these as of this period or as Visigothic. They do not conform in style to the Justinian or Justin II period, and the obverse legends are anomalies in any period. I suggest that A 2c is non-Visigothic. Such a possible variation developing from A 2 might indicate indirect relationships between A 2 with later Visigothic issues insofar as it presents the early stages in the development of the four-legged Victoria types. The group does bear closer resemblance, notwithstanding diverse Victory types, to A 4 than it does to A 1 or A 3.

### GROUP A 3 (PLATES III–IV, 65–82)

The second largest of the Anastasius groups presents a stylization of types directly dependent upon A 1 with close affinities to groups classified under Justin I. I suggest that this is a later issue of the A 1 mint. These coins present the most developed characteristics that particularly distinguish Visigothic coinage of all the Anastasius pieces. This may indicate even a later date than other groups, A 2 and A 4.

The pectoral cross has become an established motif, while the chest formation is developing towards the truncated pyramid shape. Only the fibula, the pleats of the sleeve and one fold parallel to the neckline remain of the original. Also the double contour on the left side of the chest has now appeared. The head is a simple mass, with the diadem strongly incised and the eye pronounced as a dot. The striding Victory is assuming its roughly carrot shape, although the drapery folds, front and back, are still distinct from her legs. She has even maintained her human head with discernible features.

The legends are consistent as an extension of A 1, except where obvious die copying and recutting leads to orthographic errors. There are several coins with changes in the final letters of the reverse *AVGVSTORA*, however, that might be meaningful, e.g., *AVCVSTOR·T·*.

These coins are no different in weight and style from all others of the group. Also note the particular care given to the B of CONOB on several coins. It is included, even if it must extend above the exergue and infringe on the end of the reverse legend. This particular device develops further in group JI 1.

The weights of these coins are lower than those of A 1, with half the coins ranged from 1.44 to 1.47 gms.

*A 3a*

(PLATE IV, 83-84)

There is enough stylistic variation in the chest types of both of these to separate them from the entire group.

*A 3b*

(PLATE IV, 85-88)

Coins, particularly Nos. 85 and 86, may illustrate a natural stylistic extension of the coin types of the group. The rigid geometric structure of the design, the inverted COMOB inscription, combined with the correct reverse legend VICTORIA AUGUSTORUM and the "s" on the reverse field, however, encourages a non-Visigothic attribution. This is particularly true of the Paris coins in this subgroup which are presented here only because they also have an "s" in the reverse field.

*A 3c-A 3e*

(PLATES IV-V, 89-93)

Although associated with this group in nature of types, the N in the field of the one group and the treatment of the design in all suggest also a non-Visigothic variation of the A 3 group.

GROUP A 4

(PLATE V, 94-98)

These coins have Victories similar to those of A 1 and would seem to be slightly later or contemporary even in regard to style of portrait bust, comparable weight, and more accurate transcription of

the legend. There are many gaps in the structure of this group, and consequently it is more difficult to see the stages in the stylistic development. This accounts for sub-groups A 4a and A 4b which are suggested as Visigothic, either of the same mint as A 4 or of the same locality.

The rounder and more plastic obverse head relates this group to the technical workmanship and prototypes of the A 2. The chest type varies from one with repeated curving folds (PLATE V, 96) to one with angular folds (PLATE V, 95). Although the Victory figure (PLATE V, 94-95) represents the Victory of A 1 with graceful, flowing ribbons front and back, the other two coins, (PLATE V, 96-97) present a stenographic reduction of the same figure. The Victory in these has decidedly the two leg form ( $\angle$ ) with less-emphasized front and back appendages. It begins to appear as if the figure was made by copying directly from a worn piece, such as No. 95, or by pencil shadowing such a coin. Legends are similar and, aside from the surprisingly low weight for one of the coins traced to the French Gourdon Hoard (1.17 gms.), the weights are standard, 1.43-1.50 gms.

#### *A 4a*

(PLATE V, 99-100)

The two coins resemble the first two of A 4 in obverse facial type and in Victory form but differ in the imperial chest. Instead of a single or double line on the left side framing the chest, there is a series of vertical lines balancing the vertical sleeve pleats on the right side. These coins also follow the group in maintaining the usual weight but do vary in legend. The  $\Lambda$ VCVSTORVA is replaced by  $\Lambda$ VCVSTORO and is preceded by a cross. The use of a cross within the legend is to be found in some coins of A 1, but here it comes at the break in the name of the emperor on the obverse DNANASTA+SIVSPPAVC.

#### *A 4b*

(PLATE V, 101-102)



These two coins repeat the obverse chest type of A 4a, with a more stylized and linearly conceived profile bust. This is true in the

Victory figure as well where legs and front and back appendages are becoming confused. These compare with the entire group in regard to weight and with A 4a in legends, although in the latter it is technically retrograding: VICTORIA AACVSTORI. The cross, as in some coins in A 1, appears in the obverse legend.

The entire A 4 group relates to A 2, although it is the closer of the two to A 1. Furthermore, it is from A 4 that connections may be made directly to later Justin I groups.

### GROUP A 5

(PLATES V-VI, 103-112)

The distinctive feature is the use of a monogram in the right reverse field, either  or, as in A 5a,  (PLATE VI, 113-115). The treatment of the profile portrait and of the striding Victory is different from all previously classified Anastasius coins, although the general character of the design suggests a coeval minting with those of A 1, A 2 and A 4. Most unusual is the treatment of the Victory, with the lower hem of her chiton fully defined, preserving the nature of a skirt rather than creating flaring separate ribbons or extra legs. The legends remain fairly intact with the D of Dominus maintaining its integrity and with a preference for VICTORIA AUCUSTORUM on the reverse. The weights are likewise standard, with only three (1.35, 1.35 and 1.42 gms.) falling below 1.45 gms.

The single coin in A 5b (PLATE VI, 116) is badly preserved but stylistically fits best with this major group. Instead of the monogram in the reverse field, it bears the letters > and T respectively in the left and the right.

This group forms stylistic contact with only one other Anastasius group, A 6. If the monograms may be read as Gundomar and Sigismund, the Burgundian attribution of these seems highly probable. These coins may only be related to the later groups of JI 5 and Jan 11, both of which also stand apart from all the other classified groups. All may then be attributed to the Burgundians. The coins are sufficiently different from those of the other Anastasius groups to be considered as a possibly different national product.



## GROUP A 6

(PLATE VI, 117-124)

This group follows more closely the tradition of A 5. The Victory, with its hemmed chiton and its strong striding step, is particularly similar to that found in group A 5. The obverse portrait preserves the same design technique and approach as seen on coins of A 5. There is, however, a stronger emphasis on the legs of the Victory under her skirt. The design of both types reveals a stronger assertion of contours, a sharper and more angular line than found on coins of A 5. This is seen in the handling of the diadem where (↗) is preferred to the (↘) of A 5 (e.g., PLATE VI, 113). These distinctive style aspects are particularly demonstrated in a more crudely executed example (PLATE VI, 118).

As noted in the legends of A 5, the D of Dominus is correctly done, and the reverse legend remains VICTORIA AVCVSTORVM. The only difference is in the ending of the obverse legend, when often . . . . PRFAV is preferred to . . . . PPAVC of A 5. The weights in this group compare favorably with those of A 5. This group may also be Burgundian.

*A 6a-A 6b-A 6c*

(PLATE VI, 125-127)

The coins in these sub-groups are most likely of the same national mint, or of the region of the major group A 6. They are separated because of the differing letters found in the reverse field of each of the coins.

## GROUP A 7


(PLATES VI-VII, 128-131)

These two beautifully modeled examples must be separated from the rest of the Anastasius groups. Not only does the exquisitely detailed Victory stand on a globe on one, but also the refined craftsmanship throughout reminds us of the earlier naturalistic traditions of Roman imperial coinage. The profile bust has fully modeled hair

with emphasized bangs, detracting from the diadem, so eminently stressed on all other coins studied. The fine craftsmanship extends to the legends which are carefully executed. Here, too, as seen on some other Anastasius coins, the "Pius Felix" on the obverse legend replaces the "PerPetuus Augustus".



The style of these suggests the mint of Rome.

GROUP JI 1  
(PLATES VII–VIII, 132–167)


This group immediately recalls Group A 3 with similar imperial facial types although with a new variation in the chest form. In the early examples, (PLATE VII, 132–133), the standard right side remains the same in all cases with the sleeve pleats and fibula, but the left side presents downward and inward curving lines from the double line of the left contour as seen in coins of A 2 and A 5. These left side folds have been interrupted or erased and prevented from meeting at the bottom edge of the coin in order to provide space for the pectoral cross. These folds parallel two small folds on the lower left side of the chest. The chest type for the group develops from this, in which the central chest area occupied by the pectoral cross is framed by balancing downward curving folds in both lower corners , a device which is to be maintained into Leovigild's

coinage.

The Victoria is the carrot-shaped striding type with the six legs more pronounced. The truncated pyramid shape of the bloused part of the chiton has been joined as one piece to the mass of the neck, while the skirt of the chiton has become all legs. The method of constructing the head directs us to a later development. The mass of the jaw and the cheekbone are all one piece with the upper chiton and neck; a dot provides the eye, a line the nose and forehead. The mass of the back of the head has been incised to form a diadem creating a comic hat-like impression with the rest of the raised mass of the head. This juxtaposition of mass of head and dot of the eye, intercepted by the incision of the diadem, will later create the X-shaped Victoria heads.

These coins bear legends that are similar and relate closely to those of A 1 and A 3. There are some that continue the . . . SIVSPFΛVC seen in a few coins of A 1, and there is one that uses a cross in the middle of the obverse legend. However, there is an increasing tendency for confused legends because of the failure to take care in executing the letters. The letters D and S begin to lose their character and without delicate and careful workmanship begin to be simply vertical sticks. The letter N loses its diagonal connection and becomes ll. The use of triangular punches in some coins to form many of the letters will naturally increase the tendency for confusion and create unintelligible legends. This is seen in a coin in the British Museum, where the letter l is formed by a triangular punch: ; and in a Paris coin, where a T is formed: . The use of geometric forms to construct letters can only create complete unintelligibility when not handled expertly. This of course does happen in the later Justinian issues that stylistically are associated with this group JI 1.

As the potentiality for confused legends rises, the standard weights of these coins become increasingly variable. The majority of the coins remain in the area of 1.43–1.46 gms., but weights below 1.40 gms. are more frequent than previously noted. The actual span is from 1.05 to 1.50 gms.

There are a few coins within the group that indicate a progression to Justinian groups, such as some in Paris from the Alesia Hoard (PLATE VII, 150–152). Some of the coins in the variable groups (JI 1c, JI 1d and JI 1g), however, also indicate this Justinian connection. These may very well be examples of the group late in the reign of Justin I or early in the reign of Justinian. Their legends suggest a Justinian reading, while the unusual manufacturing of the letter R (PLATE VIII, 174) with one circular and two triangular punches () is to be seen only in the time of Justin II and Leovigild (Group JII 5). This coin may very well share in the prototype rôle for the group, JII 5.

*JI 1a*

(PLATE VIII, 168)





This stylistic variable has a distinguishing reverse legend which seems to read *Gloria Romanorum* rather than the usual *Victoria*

Augustorum. Its Victory reverse is closer in style to the full-fledged members of this group, but the reverse is somewhat different conceptually. Since this coin comes from the Alesia Hoard and is therefore of French provenance, it may be a Merovingian or Burgundian imitation of a Visigothic issue.

*JI 1b-JI 1h*  
(PLATE VIII, 169-178)

These sub-groups are vaguely connected in style to JI 1 and may or may not be Visigothic. They may illustrate how the portrait stylization on JI 3 developed. In some (JI 1b, JI 1c, JI 1e, JI 1f) the elongated chest type is cursorily achieved so that the chest and head of JI 3 is a natural consequence. The legends reveal a less disciplined technique.

GROUP JI 2  
(PLATES IX-X, 179-204)

This group has its strongest ties with group A 4 in both facial type and treatment of the Victory. The pectoral cross, so much a part of the A 1-A 3-JI 1 group, is not seen on half of the group. The classical modeling traditions survive with a delicacy for detail and subtle nuances. This is best seen in the London item (PLATE IX, 179) which may begin the group but is also to be seen in the Paris-Alesia Hoard coin (PLATE IX, 181). The chest form retains the drapery lines that smoothly curve uninterrupted across the chest . This design later becomes angular (PLATE IX, 191) , although the head and neck retain the subtle modeling. The pectoral cross bust develops naturally from these (PLATE IX, 194) . It creates the same form in a long chest type (PLATE X, 203)  which particularly introduces the form of a Justinian group (JAN 3). The Victory figure maintains the two-leg device, with chiton skirt folds adding the extra legs and therefore following closely the Victory of JI 1. There

is a tendency, however, to maintain a sharper distinction between the blouse of the chiton and the meeting of wings and arms and neck as a shoulder point. This more human effect, added to a still careful delineation of facial features, makes this Victory more realistic. On some coins (e.g., PLATE IX, 189) the left, wreath-bearing arm of the goddess is in a bent position as seen on two unique coins placed in a sub-group of JAN 3, JAN 3a (e.g., PLATE XV, 313-314) which follows directly in style from JI 2.

In accordance with the greater technical skill and refinement observed in the making of the dies, the legends are more legible than those of JI 1 and are of good quality. On the reverse, the VICTORIA AVCVSTORA gradually develops into VICTORI, or VICTOR AVCVSTOR, or AVCVSI, or AVACTOS. The latter legend becomes common in what may be later groups, such as JAN 3 and JAN 5. The weight of these coins also retains a standard of 1.43-1.48 gms. with only two coins below 1.40 gms. (1.31 and 1.30 gms.). From this group naturally develops group JAN 3.

The single coin of JI 2a (PLATE X, 205) as well as the single item of JI 2b bears a questionable stylistic connection with the major group. The variable in JI 2a suggests such an early coin in the group as No. 179 (PLATE IX) although the approach is more linear, and subtleties of line and mass modeling are absent. This variable also possesses a cross in the right obverse field. The Alesia item in JI 2b (PLATE X, 206) has a faint relationship with possibly earlier coins in this group, but an increased dependence on line and on even less use of mass and understanding of modeling separates it from the group. It also bears a star in its left reverse field to separate it further. Its legend does resemble some of the coins, but the general conception of this coin as well as that of JI 2a suggest variations that are imitations of JI 2 coins rather than products of the same or adjacent mints.

### GROUP JI 3

(PLATE X, 207-217)

This group is associated with A 1-A 3-JI 1. It may be a later extension and variation of JI 1. This connection is observed when

weights, legends and types are studied. The Victory remains constant with *JI 1*, but the obverse portrait marks a further change in style. The modeling of a *JI 1* head always emphasized the transition from face to hair, so that its mass minimized the diadem; consequently, when worn, the diadem would be lost and the frontal mass of hair would substitute for it. Once the lines of hair dominate the mass of the back of the head, the normal contour of the head is lost. The effect is of a flattened head with hair standing on end.

The chest is geometrically simplified. It has assumed a square shape and no longer has the more intricate patterns that are found around the neck of the *JI 1* busts. Particularly important for later developments is the joining of the first and last letters of the obverse legend to the bottom contours of the chest. This effect, combined with the fibula on the right shoulder and the natural effect of greater density at the meeting of top and left contours at the left shoulder, leads to chest types such as No. 217 (PLATE X) and to those of *JII 5*



. The shoulder epaulettes of the Leovigild coins are evolving.

*JI 3a*

(PLATE X, 218)

This coin seems closer to the *JI 3* group than to any other. The profile bust is in the *JI 3* manner, although the chest is closer to *Jan 2* than to *JI 3*. Although the reverse legend is illegible, the obverse legend unquestionably reads Justin, so that the coin must be placed within a Justin group, unless it is a rare example of the placing of an earlier emperor's name on a coin issued during the reign of a later one. However, as is so with the portrait head, the Victory on the reverse is in accordance with those of *JI 3*. What distinguishes this coin from the major group is the obverse chest type and the star in the left reverse field. The closeness of the chest type with those of the *JAN 2* mint may suggest an influence from the *JAN 2* mint and therefore may indicate that *JI 3a* is a very late product of the *JI 3* group, possibly continuing to be issued into the early period of Justinian.

*JI 3b*



(PLATE X, 219–220)

This variation from the Alesia Hoard also has a conglomerate character with an almost JAN 4 portrait chest, and a profile head that is a variation of the JI 3 group. The Victory figure is more within the tradition of JI 3. This coin must then be either a variation of the JI 3 theme or a single example of a new group. Its provenance might suggest that its uniqueness from the rest of the group is that it may be a Merovingian product. The Grierson item demonstrates similar characteristics.

## GROUP JI 4

(PLATE XI, 221–226)


This group is made up of the only Justin coins that may be associated with the earlier Anastasius groups of A 2. This is particularly obvious in the form of the Victory which has developed into a definite stick figure with two appendages in the front only. The small triangular chiton is almost nonexistent. The head does have some facial features but these, through wearing, may readily develop into the round ball as seen in No. 221 (PLATE XI). This is found in later JAN 5 examples.

The chest type has changed radically from that of A 2 and may only bear some relation to No. 56 (PLATE III) which is in A 2b. The head is not too unlike that which is being produced in A 3 and JI 1, but the chest is quite singular from these. The trapezoidal and square shapes are developing with contours composed of dots. The work is still in the delicate touch of the A 2 craftsmen, and a rich effect is produced. It is not a great step from No. 56  to No. 221 . The chest type is further enriched by additions of decorative "buttons" within the border of the left side (PLATE XI, 223) and in a second fibula (?) on the left-side shoulder unattached however and somewhat in the field.

Finally, the Paris coin from the Gourdon Hoard (PLATE XI, 226), which may be a variation, presents a strange dwarfish Victory with better modeled body and a large head to enable its features to be

delineated. This latter Victory and its accompanying legend immediately recalls the reverse of those coins of A 2c, e.g., another Gourdon treasure piece (PLATE III, 60). This must be of the same mint. Three other coins of A 2c (PLATE III, 62–64) reveal similar handling of delicate, rich details in the obverse faces not unlike the workmanship of the present group being discussed, and all seem to indicate being products of the same atelier. The midget-like Victoria is to be seen again in two coins bearing the name of Leovigild from the Zorita Hoard (PLATE XXIV, 475; PLATE XXV, 477) which are placed in JII 3a.

GROUP JI 5  
(PLATE XI, 227–231)

These coins present several distinguishing characteristics that disassociate them conceptually and formally from all other groups discussed so far, with the exception of groups A 5 and A 6. The reverse face evokes particular comment with its  monogram in the right field and its star in the left. It carries a solidus type legend on the reverse. The Victory figure is singular with its columnar-like chiton and the characteristic bent arm which bears the wreath-crown. The portrait bust does not include the pectoral cross but only a series of parallel folds diagonally across the chest. The diadem is reminiscent, as really is the entire obverse bust, of the types seen in the above described groups, A 5 and A 6. This may be a later product of this same mint or mints. As is true with groups A 5 and A 6, the combination of stars and monograms in the reverse fields, which are distinguishing elements from all other Anastasius groups and Justin I groups, may suggest a non-Spanish origin or provenance. A Burgundian attribution seems most probable.



GROUP JAN 1  
(PLATES XI–XII, 232–245)






This group follows naturally from the progression of A 1–A 3–JI 1–JI 1d. The portrait bust especially follows such coins as No. 150



(PLATE VII) and No. 174 (PLATE VIII). The head has been enlarged, but the same large mass of hair through which is incised the diadem reminds us of JI 1 and prepares for the head of JAN 2. The chest type of JI 1 has been further altered in the name of symmetry, although it persists in one example (PLATE XI, 233). The old chest



has become . It has become increasingly geometric yet in a different line of development from JI 3. This chest begins to take on the shape of that of JAN 2 in the progression of increased simplification:  (PLATE XII, 242).

The Victory is the carrot-shaped type that has developed through the period of Justin I and has the six legs and form that also belong to the A 1 progression. A further phase is noted here in comparing the Victoria of No. 232 (PLATE XI) and No. 238 (PLATE XI). The Victoria on the former still possesses the hat-like headdress noted before, but it has been manufactured differently. The head is now formed by a diagonal, raised line which creates the hair line. Perpendicular to it another raised line suggests the back of the head . The eye is suggested by a dot on and a little below the meeting of these two lines . A line forms the nose,  and another line the jaw , while the rest of the face is formed by the carrot-shaped body .

In coin No. 238 the mass delineations and distinctions have been simplified, and a rough X shape for the head evolves. As a simple symbolic design form it takes hold for the rest of its life span. A further significant aspect of some of these Victorias is the "dot" that is found in the middle of the void between the two main striding legs. It does not appear on No. 238 and No. 242, but does on No. 232 and No. 240 (PLATE XI). It has a simple logical explanation and derives naturally from the "dot" ends of the ribbon drapery folds that fluttered between the central legs on the earlier coins. Simplification and further stylization have removed the folds from between the major or center pair of legs leaving behind one of the dots. That there is no further significance or interpretation of

any kind to be placed on the presence of this "dot" seems unquestionable.

The legends are not so clear as in earlier coins. The name of Justinian is assumed: DNVIINIVIVSPIAC : ON VSTINVIVSPIVC; ONVSTIN . . . . . VIIVSPIAC. The reverse legends are even more unintelligible: IVTOI VOTAVI, and VICTOAI IIVTONAVI. Nevertheless, these are consistent in the manner in which the inscriptions are formed. Only in coin No. 242, which must be late in the group, is there a greater degree of variation and this particularly in the obverse legend: OIHIT<sup>•</sup> HVIHIC. Its reverse legend although partially destroyed follows more closely the other coins of the group: VICT<sup>••</sup> . . . . . IVII. The weight of the latter is also 1.39 gms. All the coins of this group that evolve between JAN 1 and JAN 2 contain unintelligible legends on the above order and, with the exception of one, all are of poor weight.

*JAN 1a*

(PLATE XII, 246)

The single coin placed in JAN 1a presents a different version of what this atelier has designed. Its chest type assumes the simplified state of the late JAN 1, yet the treatment of hair and diadem on the portrait are not of JAN 1 style. The head appears to be more of a variation on the theme of JI 3. The legend is also singular in the manner of its structure and is as close to those of JAN 1 and JAN 2 as it is to any. The Victory is within the group tradition and this combined with its general aspect places it within the A 1 progression.

GROUP JAN 2

(PLATES XII-XIV, 247-277)

This, the major issue in the Justinian period, extends directly from the coins of JAN 1. In the constant development of the stylization of forms from three-dimensional plastic masses to two-dimensional linear designs, this group almost achieves the aesthetic resolution. The jaw, cheek and neck are still partially modeled, but everything else has been conceived in line. The mass of frontal bangs, the

9°

diadem, and the back of the head have been geometricized to create








a two part section of raised lines for back of head, and lines of hair filling a triangle for the frontal area, separated by the two raised lines for the diadem. The eye is formed by the usual bead of gold,


but it is set in a raised circlet .




The nose, a cuneiform stroke continues from the hair line. Two raised strokes form the lips =.

Variation is noticed in the handling of the diadem from the angular  to the sweeping curve  or  to a straight line  from which stage the Leovigild VPW coins do not seem far away (PLATE XII, 259).

The chest is completely flat and realized only in a linear pattern which continues the form already seen in the late JAN I .

The fibula is sometimes present, and the small folds decorating the lower corners the pectoral cross zone are sometimes left out. In some the pleated sleeve persists on the right side but only as an extra line on that side .

Legends vary considerably from being legible to being completely unintelligible, although there is a degree of consistency within the group. There is an increased tendency to use the repetition of straight lines and I and V combinations that are seen so frequently in the later coinage: IVIVSTIIIIIVIC (PLATE XII, 249). The most constant form for the reverse legend is VICTOAI VTOIAVI, and almost all present the "conob" as CŌNŌC which is stylized into . In accordance with the garbling of the legends, more coins fall below the 1.40 gms. mark.

This group is of further interest because it contains the earliest coins from the Zorita de Los Canes Hoard. They account for most of the crudest examples of the group. Only two (PLATE XIII, 267, 272) bear somewhat intelligible legends: IN V2TI NIVNV, INIVST NIANVV, IOTIVINIVSN and VISAV IVΛΛO. The rest bear legends which are consistent among themselves as well as being closer to the two legible Zorita coins than the non-Zorita legible coins. The more jumbled legends, as is always the case in Visigothic coins have a

more self-conscious structure than immediate impression would reveal. The Zorita legends are as follows on the obverse: ITVAIVIC or ITAVIITAVII; and on the reverse IN·IOAVIIIIV or ITTII VI. The "conob" is always *ONNO*. The weights of the seven coins are all below 1.40 gms. with the exception of one (I.11, I.12, I.23, I.33, I.34, I.34, I.41 gms.).

The distinctiveness of the Zorita coins must imply either a different mint or a different period, or both. It would seem logical for them to be part of the last issues of JAN 2 and therefore possibly after A.D. 550 and the beginnings of Byzantine occupation. A later date could be substantiated by style. The types are similar to the rest of the group but much more reduced to linear patterns. The Victoria is a stick figure and its legs are much closer to the form of the Leovigild insect variety. The profile bust is almost completely without mass.

JAN 2 is one of the most significant groups for the late stages of the anonymous coinage. Its coins (e.g., PLATE XIV, 278, 280, 282) form direct ties with group JAN 8 from which the major "curru" groups and the final Leovigild INCLITUS REX must evolve. It also has an indirect relationship to or influences groups JAN 4 and JAN 5 from which stem almost all of the remaining anonymous issues of Justin II and Leovigild.

*JAN 2a*

(PLATE XIV, 278–287)

This variation is of considerable importance because it may form the link between JAN 2 and JAN 8, since it naturally forms a step in the stylistic progression between these two groups. This variant may be interpreted, consequently, as a late issue of the JAN 2 group from which the later JAN 8 develops, or it may be interpreted as a concomittant variation and development. The legends and weights, as well as design, are all in line with JAN 2.

*JAN 2b*

(PLATE XIV, 288–295)



These coins are further variations and perhaps would be more correctly grouped as "unsorted;" nevertheless, their resemblance to

JAN 2 is apparent with some qualification. Such coins as Nos. 292-294 (PLATE XIV) are so crudely formed that they do not seem possible as products of an official mint. They are also dissimilar to major types of coins studied so far and therefore suggest an unofficial mint. Coin No. 295 (PLATE XIV) presents an interesting variation of JAN 2 because it maintains the same type style with a completely different flange composition.


*JAN 2c-2d*  
(PLATE XIV, 296-297)

These coins are distinctive not only in the realm of variant designs but also because of letters in the reverse field. JAN 2c has a T in the left reverse field, while JAN 2d has an A (?) in the right obverse field.

GROUP JAN 3  
(PLATE XV, 298-312)

These coins are a continuation of the long chest type of JI 2, with the same unmistakably rich, delicate linear style and more realistic facial modeling. This group is comprised of coins which still adhere to classic aesthetic values, as particularly seen in the imperial portrait. The non-pectoral cross-chest type still survives, although it is obviously being replaced by the pectoral cross form. Drapery folds are never abandoned in the pectoral cross area, however, for they are squeezed in around, above, and sometimes below the cross (PLATE XV, 300, 303-304).  is simplified to .

The Victory figure continues the type which can be traced through the A 4-JI 2 progression: truncated pyramid chiton with ribbon skirts; delicately slender and graceful wings; continued discernibility of facial features. The ribbon folds of the Victoria's skirt are the same in number as in the A 1 progression; however they are not so likely to be confused with the legs of the figure as on those of the A 1 progression, (e.g., PLATE XV, 299). This functional awareness of the integrity of the human figure is revealed in a remarkably conceived coin (PLATE XV, 308), where the skirt folds are almost

nonexistent, and the figure strides boldly on two strong legs. This particular coin indicates the remarkable feeling for rhythmic design and delicacy of line characteristic of the A 4-JI 1-JAN 3 atelier. It is not unreasonable, then, to accept No. 309 (PLATE XV) as a late stylization in this group. This coin presents a stick Victory with the distinctive graceful and delicate ladder wings, without details of costume, and with only two legs. The head, although still with features, very quickly transforms itself into the X or  coxcomb shape seen in the issues of JAN 5. Here, too, the obverse portrait has been reduced to an almost completely linear pattern with devices not very different from those of JAN 2, although with a different effect. The head, or more correctly, the linear strands of hair are divided into back and front sections by the almost vertical single diadem line.

The obverse legends remain very legible and the reverse legends after a few VICTORIA ΛVCVSTORVA and VICTORIA ΛVCVSTORO tend to abridge to VICTORI ΛVCVSI. The weights remain good with only three descending below 1.40 gms., although No. 309 (PLATE XV) goes as low as 1.08 gms.

As JAN 2, JAN 3 is important for its connection with the late autonomous coinage. Its rôle is not so clearly and visibly defined as that of JAN 2, but an indirect relationship with JAN 5 can be acknowledged. If more coins of the group were known to us, its rôle might not be so problematical.

*JAN 3a-3b*  
(PLATE XV, 313-315)


These variables are unique if not even bizarre. It is not difficult to establish a case for Nos. 313-314 as alterations and modifications of group JAN 3.

No. 315 bears the usual solidus legend rather than that of a tremissis.

GROUP JAN 4  
(PLATES XV-XVI, 316-329)

This group cannot be placed in a direct relationship with either of the A 1 or A 4 progressions but offers us a new type which may

or may not suggest a different and possibly new atelier. Nevertheless, the abstraction seen here is completely within the Visigothic tradition. The chest is a simple trapezoid, outlined in two or three lines of dots with a pectoral cross in the center. The facial type reminds us of a JAN 2 in its proportions, but the treatment of the top and back of the head varies. The diadem has been made so as to cut horizontally back from the forehead and eye, thereby deleting the frontal lobe found on the other coins. Sprouting upward from the diadem are the vertical strands of hair which create again the illusion of hair standing on end. This effect was already produced in the earlier JI 3, which, however, bears no stylistic relationship to the present group.

The Victory is a long-legged, elongated type with front and back skirt folds that in some examples assume the character of legs. With their carrot-shaped bodies, they come close to the figures of JAN 2. The head is modeled very well in some examples, with a very pronounced line of the nose,  and is a prelude to the X shape head (PLATE XVI, 321). This has also been previously noted in the JAN 2 group.

The distinctiveness of JAN 4 is also indicated in the consistent reverse legend: VICTORI AVCTINI or VICTORI AVCTIN. The letters are all well formed, and the obverse handling of Justinian's name is always legible and correct. There is no evidence of the usage of the triangular punches observed in JI 1, JAN 1 and JAN 2. As with the legends, the weights remain of good standard, the two lowest are 1.36 and 1.39 gms.

### *JAN 4a*

(PLATE XVI, 330-331)

Attached to this group are two coins which may indicate a transitional step into the "curru" coinage. The first item bears a reverse legend which is beginning to assume the "curru" form: VTAVOII IIOAVRRV. Its Victory has also acquired the "rabbit-eared" head. The second coin (PLATE XVI, 331), which varies slightly in chest type from the preceding one, seems definitely to lead to "curru"

group C 5. Although there is no consistency in the reverse legends, particularly the reverse legend of the second coin which so much more approximates the C 5 form but does not suggest the "curru" motif, the general character of both seems to relate them to each other and to JAN 4.

*JAN 4b*  
(PLATE XVI, 332-333)


One anomalous item may or may not be associated with this group. The legends are in good Justinian order, yet the portrait is on the exact form of "curru" group C 1. The Victory figure, on the other hand, is unique but it relates to this group JAN 4 in its head form and particularly in its relationship to the reverse legend. No other coin studied presents the skirt in the form it achieves here. On the obverse chest, the gold beads appear almost machine made with holes in the centers of some of them. At best this coin may be explained as a borrowing of types from different mints or a Suevian imitation. I am strongly inclined to consider it not Visigothic.



The Grierson coin, although far more crude, might be included in this group.

GROUP JAN 5  
(PLATES XVI-XVIII, 334-361)

The second major group of Justinian coins also consists of coins from the Zorita Hoard. The group bears a resemblance to the other major group JAN 2, which also includes Zorita coins. The stylization lines of both seem contemporaneous but in slightly variant directions. The head is longer. A characteristic diadem is formed by two almost vertical strokes; a marked hair line frames the face, and the whole head area is conceived in lines of hair strands in the hair-on-end fashion. A crescent shape identifies the ear; a round bead with a circle around it the eye. The chest is a square formed by a double line of round beads, with sometimes a third line on the right side, recalling the old pleated sleeve (PLATE XVII, 344). The portrait is not without comparison to the one finally seen on Leovigild's coins.



The stick Victory is two-legged with two frontal appendages that are sometimes short and sometimes long enough to be confused with the legs. Her head is either X shaped or a rough coxcomb  and, on one Zorita coin (PLATE XVII, 347), a round ball. This Victory figure recalls those of JI 4, but the proportions and execution are completely different. There are even distinctions between this and the very stylized Victory in JAN 3 (PLATE XV, 309) where the skirt appendages have been entirely dropped. This distinctiveness on the part of JAN 5 coins may very well point to a new separate atelier as we have already granted to JAN 4. However, the connection with JAN 2 and particularly JAN 3 which has potentially three, four, or six legged Victories may be stronger than I am able to establish.


The legends are most consistent, DN IVSTINANVS PAVC and VICTORA AV2T or AV2TO or ACSVSTO or LAV2TO or LAV2TOI or VVA2T or LAV2TI. The reverse legend recalls both JI 2 and JAN 3. Even the manner of executing the letters and the clarity of the form is in the best traditions of the A 4-JI 2-JAN 3 progression. However, as in JAN 2, "conob" is formed as  or . The weight standard is maintained around 1.43 gms. although eight coins fall below 1.40 gms. with some going as low as 1.07 gms. This tendency has also been noted in some coins of JAN 3.

Contrary to what was indicated with Zorita coins in JAN 2, Zorita coins here relate to the rest of the group on an equal level of quality in style and legends. The importance of JAN 5 is in its being a possibly early example of a mint which also produces some major Justin II types.

#### GROUP JAN 6

(PLATE XVIII, 362-364)

The three coins classified here are variations on the JAN 2 theme. They unquestionably relate to the A 1-JAN 2 progression. The legends are now fully jumbled, although, as is always the case, completely consistent within the orthographic customs of the mint. Punches are used in one case, although not so extensively as in the

other two items. The legends: DIVIOIA IIOIVIC and ITIVIV IIVITI are not too far afield from the jumbled types in JAN 2. The weights are standard: 1.42, 1.43, 1.45 gms. 

The chest type is a simple trapezoid as in JAN 4 but richly decorated with gold bead borders and ladder-like patterns in the borders



. The head is a typically late version of JAN 2 with an almost vertical diadem. The Victories with coxcomb and X shaped heads also are from JAN 2.


### GROUP JAN 7

(PLATE XVIII, 365-367)

These three coins are also variations of JAN 2. The obverse type is more exactly in accordance with JAN 2, while the Victory on the reverse offers a possibly later development with its "rabbit-eared" head. There is also the dot between the main legs of the figure. The reverse is in order with those found in the "curru" and INCLITUS REX issues. Triangular punches are used extensively for the letters which are again garbled but not inconsistent with those recorded for JAN 6: DIVITAV · IITA:V, IATIIV ITAVII. The weights of these coins are lower: 1.37, 1.38, 1.39 gms. The flange is large like that of JAN 6.

### GROUP JAN 8

(PLATES XVIII-XIX, 368-386)

This important group must extend from JAN 1 and JAN 2 because it is a transition between JAN 1 and JAN 2 types and "curru" and INCLITUS REX types. The chest is that of JAN 1 , while the head is that of JAN 2, with the addition of a vertical diadem (PLATE XIV, 280-281). The more realistic modeling of JAN 1 has been maintained, although the manner of stylization is similar to JAN 5. The general appearance of the coin is more sophisticated.

The Victory is also of the six-legged variety which begins with the carefully featured head that immediately precedes the X

shaped development. Some coins bear the dot, a feature of "curru" and Leovigild, between the center legs.

All the legends are achieved by a combination of punches, and it is not too difficult to see how the "curru" legend might have developed naturally, thereby withdrawing the necessity of ascribing any intelligible meaning. All of the weights are maintained between 1.40 and 1.45 gms.

*JAN 8a*

(PLATE XIX, 387-389)

The coins of this group may be non-Visigothic; No. 387 is a gross misinterpretation of the group style; and No. 389 is a variable but also has a low weight inconsistent with the rest of the group.

*JAN 8b*

(PLATE XIX, 390)


This coin has a reversed profile, is poorly executed and consequently seems too crude for the rest of the group.

GROUP JAN 9

(PLATE XIX, 391-393)

These coins form a distinct unit of their own. The Alesia example seems to begin the group, with its more accurately modeled imperial head and the articulate craftsmanship in type details as well as in the letters of the legends. The Victory is formed with considerable freedom, seen infrequently in coins of JAN 3, (e.g., PLATE XV, 308) and in those of JAN 4. The chest type seems to have developed from more complex examples such as seen in JAN 1 and JAN 2 and leads directly to the simple truncated form seen in the remaining two coins of the group (PLATE XIX, 392-393). The character of the profile bust recalls the group JI 1, but the total style of the coin is unique in that it has no ancestral ties with any of the Anastasius, Justin I, and Justinian groups already classified.

The two other items that make up this group are from the same die and present a simplification of the Alesia examples. The chest is


a truncated shape with pectoral cross. The modeling of the head is only a mass for the neck and the face. In order to achieve some of the detail of the Alesia coin, the die cutter had to enlarge the head with the resultant crowding of the head with the legend. The Victory maintains the rhythmic sweep of the Alesia coin, but even this has been reduced by combining and extending lines, e.g., one concave line forms the top of wings and arms; another forms the bottom of the wings, the chiton, and the two front appendages .

The weights are similar: 1.435, 1.43, 1.44 gms. The legends, to the contrary, have little if any connection. Since the three coins form a distinct class of their own, with unacknowledged ties to other groups, and since two of the three coins come from known hoards at Alesia and Gourdon and are not of Spanish provenance, it may be concluded that these are not of Spanish origin and therefore non-Visigothic.

#### GROUP JAN 10

(PLATE XIX, 394–395)

The two coins of this group are also unique and difficult to relate generically to any of the groups classified. The craftsmanship is very good, and the concept of design is fully realized. There is sophistication in the stylistic resolution and no evidence of crudity. The imperial portrait seems to suggest JAN 3, (e.g., PLATE XV, 303, 304, 308) and the originality of such a Victory reverse as seen in JAN 3a. The proportions of the obverse face are further reminiscent of the earlier JI 3.

The unusual Victory striding left instead of the customary right has been carefully designed to resemble more closely a human figure. The subsidiary appendages are paired with each of two legs, suggesting more accurately a “culotte-like” costume. The head of the Victory is well articulated; eye, nose, ear, mouth, cheek, forehead and hair mass. The wings show an equal concern for a deliberate, delicate touch substituting for the now customary ladder wings, a graceful herringbone pattern . The delicate workmanship, as well as a distinct rhythmic feeling for design, associates these coins with JAN 3.

The obverse legend is fairly regular and relatively accurate. The reverse legend has been reversed just as the Victory has been, which adds to the problematical character of these coins. When the reversed reverse legend is reversed it reads: ICTORNI COVTOIA. Both these coins may be products of the same die.

### GROUP JAN 11

(PLATES XIX–XX, 396–400)

This group descends directly from *JI 5* and is a unique example of a mint product of exactly the same die style in both the reigns of Justin I and Justinian. It further bears the distinction of containing coins which substitute the names of the Merovingian Kings Childebert I and Theodebert I for that of Justinian. This makes the Burgundian-Merovingian attribution of the entire group unquestionable. The Childebert coins are without monograms (PLATE C, 12). The Theodebert coins are found with and without monograms, *MR*, *Ç*, and also LV (PLATE C, 10–11). The Victory remains fairly constant throughout, although there is some variation in the portrait bust. The pectoral cross is always absent, permitting a more elaborate system of linear folds. All the portrait busts bear resemblances to types found in Merovingian coins, (e.g., PLATE XX, 399).

### *JAN 11a*

(PLATE XX, 401–402)

The distinction here is that the position of the star and the monogram on the reverse field have been reversed. In addition, a new monogram or letter *Ç* is substituted for the old monogram *MR*.

### *JAN 11b*

(PLATE XX, 403–406)

These coins follow exactly the design of the major group but are without stars, monograms, or letters on the reverse field.

The Gourdon piece No. 406 possesses a Victory form that suggests the Victory of JAN 9 in a more stilted and rigid manner. The stylistic relationships of the coins of this group with coins of JAN 9 and JI 5 as well as with coinage of French provenance suggest again a non-Spanish, non-Visigothic, but Merovingian attribution.

*JAN IIC*  
(PLATE XX, 407)

The single item here not only is a much cruder performance but bears the letter K in the right reverse field.

GROUP JII 1  
(PLATE XX, 408-410)

These coins descend from JAN 3. Besides the legend tradition that is maintained, there is the handling of the letters as well as the general workmanship. The technical handling of the facial features on the obverse portrait compares exactly with that on JAN 3 coins (e.g., PLATE XV, 304). The excellent modeling of the face and the subtleties achieved in the variations of cheek, jaw and mouth, as well as the conception of the eye and nose are all in JAN 3 tradition. The chest is a simplification in the manner of No. 310 (PLATE XV) and retains an almost unconscious motif, the curved drapery fold under the pectoral cross, which was noted in the JAN 3 issues. The characteristics of the long chest have been retained. The head structure is not unlike those achieved in JAN 2 and JAN 8 and reveals how contemporaneous these issues may be.

The Victory figure with X shaped head also has the rhythmic sweep of wings characteristic of JAN 3. This group is a later and more successfully conceived design of No. 310. These coins may form an intermediate step between JAN 3 and JII 7.

GROUP JII 2  
(PLATES XX-XXII, 411-434)

This group is composed of a large number of coins from the Zorita Hoard and unquestionably descends from JAN 5. There is approxi-

mately the same degree of stylization observed in the relationship of both types. The rectangular or trapezoidal chest, the vertical diadem, the carrot-stick Victoria with four legs all encourage the ancestral connection with JAN 5. This is further seen in a cursory check with the legends, for JII 2 also has a propensity for those variations of VICTOR  $\Lambda\Lambda V\tau TOI$  or VICTORII  $\Lambda\Lambda VSTI$ , while the obverse reads:  $\text{CIIIVST VSPAVC}$  and never loses the Justin identification.

There is a fairly wide degree of variation in technical workmanship within the group. These coins are much cruder than JII 1. The style quickly degenerates from JAN 5's portrait to the hair-standing-on-end variety (PLATE XXI, 423, 428, 430). In one example (No. 430) the Victory has the rabbit-eared headdress without the ears. The Zorita Hoard again provides many of the crude and singular specimens (e.g., PLATE XXI, 429-431), as well as all of the crude and questionable variables in JII 2b.

The weights are as variable as the type styles. The standard is the lowest studied so far; out of thirty coins studied and classified in this group only seven are 1.40 and above, and only three are between 1.30-1.40 gms. There are two recorded weights as low as 0.86 and 0.98 gms. There is no direct proportion between crude and low weight coins, although there is a direct proportion between stylistic variability within a group and weight variability. Three of the five crude Zorita issues with reversed Victories weigh 1.41, 1.47, 1.48 gms. The crude and bad condition of No. 433 does suggest No. 315 (PLATE XV) in JAN 3b, further encouraging the connections of JII 2 with JAN 5 and JAN 3.

### *JII 2a*

(PLATE XXII, 435-437)

Grouped here are three coins of relatively similar conception, in one both types and legends are reversed, in a second this alteration is seen only on the reverse. The curious Zorita item, No. 437, bears a legend on the reverse which might be read as Liuva:  $VLIVV V\cdot UVA$ .<sup>2</sup>

<sup>2</sup> Cabré classifies this (Zorita No. 45) as a garbled legend of Justin II. I have discussed this above on pp. 65-66.

*JII 2b*

(PLATE XXII, 438-440)

These are very crude examples, two with reversed Victories, and one with both obverse and reverse types reversed. These, all Zorita pieces, have been attributed to the Visigothic Narbonnensis by Cabré, yet the design is more of an imitation of Visigothic ideas rather than an original product. These must be placed in the category of unofficial strikes.

GROUP JII 3

(PLATES XXII-XXIV, 441-465)


The derivation of this distinctive style is more complex and does not stem from a single prototype. It is associated with JII 2 although not so crude, yet involved enough in similar design attitude that more stylized coins are difficult to separate into groups. Its connection with JII 2 predisposes its dependence indirectly on JAN 5 and likewise vaguely back to JAN 3 and its high standard of craftsmanship. Its Victory figures can also not help but evoke faint remembrances of the small A 2-JI 4 groups. Unquestionably we are dealing with a new group whose motivating source is outside the realm of coin progressions we have studied. The outside source is very quickly assimilated by the mint designers, and the coins with modification readjust to the stylistic level of JII 2.

This group is predominantly composed of coins from Zorita, a fact which adds to the interest of the group. Most of the series is characterized by a delicate rendition of small types. The profile portrait presents an interesting illusion of a more refined, realistic portrait in a more accurate, minute style. The square chest is worked with a double border of round beads and a large pectoral cross crowding the center. The mass of the neck and head are well modeled with the transition from neck to jaw and cheek and eye skillfully conceived in the minute scale. The diadem, almost lost in some cases because of the rich and tight treatment of the hair, is composed of round beads. It is the infulus with its two ends in round beads that is particularly emphatic. Care is given to the features with even the



ear being accurately suggested. A strong contour outlines the forehead and nose, and round beads designate the chin, the lips and the nostrils. A round bead set in the modeled eye socket is topped by a strong eyebrow line. The effect of wearing enunciates the profile contour and flattens the rich headdress to a raised smooth mass (PLATE XXII, 444). In some the delicate beads of the diadem are still partly visible, as in No. 469 (PLATE XXIV) which is grouped in JII 3a.

The wearing of the dies necessitates their being reworked, which might explain the linear, articulated and traced-like quality of No. 449 (PLATE XXIII), where the old modeling is still visible under the newly re-etched lines. The wearing also demands new dies which begin to resolve the technical problems of maintaining the craftsmanship of the first portraits. Also, the new dies begin to harmonize the first style with the general style of other contemporary mints. This is to be seen in No. 450 (PLATE XXIII). Here the almost vertical diadem, not overly emphasized so as to destroy the integrity of the roundness of the head, separates the half-moon-shaped back from the spherical triangle of the frontal lobe. The accentuated eyebrow of the original substitutes for a hair line and joins with the contour of the brow and nose. Modeling of cheek and jaw and neck are still subtly handled. The nostrils are now a straight line forming an angle with the nose profile; and the lips are also now effected by straight lines rather than round beads. The ear is still apparent, although in some cases such as No. 452 (PLATE XXIII) it begins to lose its visual meaning. The excellent craftsmanship of the artisan is still apparent in the handling of the beaded diadem and the infulas

 and of the center jewel at the top of the head. The chest remains as two dimensional as it was in the first pieces. The inspiration for these coins must be Imperial Byzantine issues such as those minted at Ravenna under Justin II, which they closely resemble.<sup>3</sup>

The next step is seen in coins such as Nos. 457-460 (PLATE XXIII) in which the size of the head has been enlarged to permit the execution of the facial and decorative details so consistently evident in this group. The chest is invariable, and the good quality of the head and neck persists. The size of the features is increased but handled

<sup>3</sup> *BMCVOL*, pl. XVII, 25-33.

similarly to those of No. 450 (PLATE XXIII). The enlargement of the head causes the first major breakdown, because the round back of the head must be curtailed. In No. 460, the beaded diadem has taken the place of the former triangular frontal lobe, and there is only space for a few strokes for hair beyond the diadem. In later crude examples (PLATE XXIV, 462-463) all parts of the head have been restored to the design at the expense of naturalism, as seen still in No. 460.

Throughout all these changes the reverse face of the coin has remained constant. The Victory figure never attained the naturalistic heights of the obverse portrait. It is always a stick figure with three or four legs, sometimes with faint back appendages, ladder wings, and coxcomb-shaped or simply rounded mass-shaped head. That the imperial silver coins from Ravenna bear only letters or crosses on the reverse, thereby providing an inspiration for only the obverse face, may explain the differences in the execution of the reverse and obverse faces.

The weights are consistently good, and only a few are found below 1.40 gms. The legends are also consistently good in noting Justin's name and in forming a reverse of  $\Delta$ VICCTO VAC with very little variation.



*JII 3a*

(PLATES XXIV-XXV, 466-477)

The coins placed here are natural, later developments of JII 3, which take the mint into the reign of Leovigild and the last moments of the VPW tremissis. The facial profiles of the obverse bust all indicate the result of the simplification of the early facial types of JII 3. The proportions of the head have returned to those seen on the early coins. The major change here is in the handling of the Victory, which has become more fluid. In some coins it has even managed facial features (PLATE XXIV, 466-467), or the X shape so prevalent in the period of Justin II (PLATE XXIV, 469-470). In such items as Nos. 471 and 472 (PLATE XXIV) the Victory is well modeled and pleasantly conceived; the legs are modeled at the calves, although the figure is still a stick form. The facial profile is delineated, and the head is characterized as a hat-wearing type.

10\*

For the remaining issues of this mint, two types of Victory forms are used with several portrait bust types. However, the placing of them all in one mint seems logical. The Victories of Zorita Nos. 475 (PLATE XXIV) and 477 (PLATE XXV) are examples of the large naturalistic head types, and Nos. 473, 474 (PLATE XXIV) and No. 476 (PLATE XXIV) illustrate the anonymous ball-shaped head similar to the earliest Victories of JII 3. All the obverse portraits have the elongated chest type, with two in the manner of all JII 3 busts and three others influenced by developments in Leovigild's

other mints . No. 477 approximates the chest of JII 5 . It is in these last coins that we begin to see the name of Leovigild, and one of these, No. 474, was classified by Miles as Type G of the Leovigild coins without mint-name.<sup>4</sup>

One major consistency within almost all the Zorita coins in this group is that they are of a poorer quality of gold. This is true for non-Zorita coins as well. The weights, except for very few, however, are very good.




#### GROUP JII 4

(PLATES XXV–XXVI, 478–494)

These coins best illustrate the influence of various mints upon each other even when not within the direct progression. Associations, particularly in the treatment of the profile head, seem to link this group to JAN 4, yet the Victories, themselves unique, are closer to those of some of the JAN 3 group, such as Nos. 311–314 (PLATE XV). General contemporary similarities are shared with JII 2 and JII 3.

A coin such as No. 478 (PLATE XXV) may well mark an early example, since its Victory so closely follows that of No. 312. The head still maintains a few strokes for hair on the top and back, a diadem with bead infulas, and a small triangular frontal lobe. This head also recalls a JAN 3 item (No. 310) as does the elongated chest, double-bordered by round beads. The modeling of the face and treatment of nose and eye follow those coins of JAN 3.

<sup>4</sup> Miles, p. 178. Miles classified No. 475 as Type A (p. 175).


With No. 480 (PLATE XXV) the chest type of JAN 6 is immediately recalled. In place of the round beads making the square contours of the chest, a small triangular punch has been used , with the ladder pattern in the upper horizontal border and two round beads on each shoulder. The use of the triangular punch is enlarged, then, in this group, for it is not only exclusively used to form the letters, which perhaps accounts for the IVIIVIIIIV inscriptions, but also to form the chest as well as the palm branch held by the Victory. Even the X head of the Victoria has been achieved by a single manufactured punch . This use of the punch may have been experimented with first in a JAN 3 variable (PLATE XV, 313), on the chest and the palm branch particularly. The Victory figure with two or three legs as seen in JII 4 may develop from such as that of No. 313. Note especially the arm characteristically bent at the elbow, which is another indication of the search for a more naturalistic conception. Such awareness is still shared in the conception of the portrait in No. 479. This is even seen in a more simplified chest variation as in a Zorita item (PLATE XXVI, 497) of JII 4a. It is the emphasis on the diadem, however, perhaps the almost cravass-like separation between its two strands, that eradicates the frontal lobe. A coin such as No. 481 (PLATE XXV) seems almost the result of a pencil tracing of No. 479, and even the round beads on the shoulder are replaced by semi-circular outlines .


All these developed aspects remain constant for all the coins whether they read IVNVIIIIVNVN, IVIIIIIIIVNVI, or IVIVIVIVIVIVIVIV-IVIVIV, or DN LIVVIGILDVS REX, and regardless of whether they bear long or short chest types. Coins (JII 4a) such as No. 497 and No. 498 (PLATE XXVI), although style variations, also carry such legends. Coin No. 500 (PLATE XXVI), a Suevian (?) variation, bears a diverse garbled legend. A variation such as that in the Volker's collection (PLATE XXVI, 501 [JII 4b]), whose legend attempts to spell LIVVIGILDVSREX and is not made by a triangular punch, is almost too crude for the group. This is the most plausible group to which to attach it, however, and it may be characterized as a very crude imitation, Suevian or otherwise.

The consistency in the system of letters evolved illustrates a conscious mint decision whether or not it is caused by the incapacities, orthographic ignorance, or the illiteracy of the mint workers. The important point is that there is at work a conscious aesthetic concern for order, symmetry and design clarity. The mint workers, nevertheless, very quickly learn to spell Leovigild's name, and these coins are exactly the same type and style as those without his name. Coins of this group have been classed by Miles as Types B, F, and G of the group of Leovigild's coins without mint names.<sup>5</sup>



### GROUP JII 5

(PLATES XXVI-XXVIII, 502-524)

This series begins with coins bearing the inscription that possibly can be read as Justin (Justin II) and ends with coins in the name of Leovigild. They possess types that bear resemblances to other contemporary Justin II groups but are also distinctive in character. The portrait has an elaborate chest; its design pattern being the final stage in a long development. It is square, or sometimes an elongated rectangle with a fibula on each shoulder balanced by two fibulae at the bottom of each side. The lower fibulae were once the first and last letters of the obverse legend (the reverse  $\complement$  which developed from the D and the final C). The pectoral cross hangs from a triangle and seems to depict a pendant jewel. A second version of this chest replaces the inverted triangle with two curving lines suggesting breasts . The head is small, slightly modeled with a strong diagonal diadem, stressed infulas and hair that stands on end.



The Victoria, a carrot figure with six legs, bears a head of recognizable human form and like the obverse portrait seems to develop out of group JI 3. Even the legends further help to ally these groups, for the particular manner in which the letter R is formed by a circular and two triangular punches  is to be found only in one other group. That is in JI 1d which may further tie JII 5 with the A 1-A 3-JI 1-JI 3 progression. When the name of Leovigild appears, it is well handled and only here does it read VCLIVVIGILDIREGIS rather than LIVVIGILDVSREX.

<sup>5</sup> Miles, pl. I, 4, 5, 6.

There is a unique coin of JII 5a (PLATE XXVIII, 525) from the Johns Hopkins collection which bears a "curru" legend variation while also using in one place the characteristic  of JII 5. The Victory is exactly that of JII 5; the obverse chest is a variation of "curru" group C 3 , and the head is a variation of C 1. Note that even with the changes the product is still within the realm of JII 5 and seems to illustrate the mint of JII 5 attempting to adopt the type established in the mint producing "curru" coinage.

Those coins of group JII 5b (PLATE XXVIII, 526-527) and JII 5c (PLATE XXVIII, 528) are variations of JII 5 that seem to be imitations of it rather than products of the same mint. (Suevian?)

### GROUP JII 6 (PLATE XXVIII, 529-533)

This is another group that forms out of products or variations of JAN 5. The Zorita coin No. 529 (PLATE XXVIII) bears a marked resemblance to JII 2, and has a characteristic chest, Victory and reverse legend of JAN 5. It seems immediately to direct the attention to later coins of garbled legend (PLATE XXVIII, 530-533). The portrait heads of these remain the same as the Justinian piece; the chest, however, imitates that of the second type of JII 5 . The Victory type in two cases repeats that of the JAN 5 group. In the other two (Nos. 532, 533), a unique Victory is found who wears a triangular gown, has only two legs and a suggested human head .

All these coins, like most of those of JII 3, are of "oro bajo." This coin may be the result of the mint's attempt to imitate the mint product of JII 5. The two examples with gown-clad Victoriae may result from an attempt to naturalize the appendages or insect legs into a more rational image, for note that the stick figure of Victoria is still suggested beneath the gown. This naturalistic instinct and desire is characteristic of those groups directly or indirectly associated with JAN 3 and JAN 5. It is within this stylistic area that JII 3 with its Byzantine sources also is placed.

## GROUP JII 7

(PLATES XXVIII–XXIX, 534–540)

This sketchy and problematic group consists of possibly similar coins rather than “exactly alike.” The legends first read Justin, break down, and then spell out LEVVIQILDIR. Two of the Leovigild items come from the Zorita Hoard and bear solidi type reverse inscriptions, VISTOI IAVCCC. If the development is accepted, the group begins with a coin (PLATE XXVIII, 534) that is reminiscent of the long-chest-without-cross type of JAN 3, and the sense for rhythm and design here and on the Victory tends to fortify this suggestion. The Victoria follows the JAN 3 type. The second coin (PLATE XXVIII, 535) may very well fall within the range of JII 3, but its X head and six-legged Victory abnegate this. Note, however, that the curving fold beneath the pectoral cross continues a JAN 3 suggestion. The emperor’s diadem is vertically stressed and the modeling of the face is simply done. The third item (PLATE XXVIII, 536) probably follows from this, and the crude (PLATE XXIX, 537) garbled legend may also connect. The culmination is in the two Zorita Leovigild pieces with trapezoidal chests and heads in which the stylization of strands of hair and almost vertical diadem have not destroyed the round, compact contour-modeling of the head. This modeling is rather subtly achieved. The Victory is four-legged and designed in an attempt to imitate the insect Victory of the “curru” types. The customary bead between the legs (placed in the center of the region bounded by the innermost legs) is also present. The head is only a round mass. This Leovigild coin is in the same category as Miles Type C.<sup>6</sup>

## “CURRU” COINAGE



By all means of analysis, coins with the legends bearing variations of the form “curru” written backward and forward must date within the period of Justin II. Stylistically they are contemporary with all Justin II groups and are direct forebears of the final Leovigild VPW tremisses. It is therefore through these coins that one sees the closest resemblance to the national coinage of Leovigild.

<sup>6</sup> Ibid., pl. 1, 3.

They may be classed in five groups according to their variation of what seems a common theme. The variations may or may not indicate different mint products and may or may not indicate a chronological order of progression. That is, it is questionable whether or not we are to read the groups horizontally, vertically or both.

### GROUP C 1

(PLATES XXIX–XXX, 541–559)

The general characteristics of all “curru” coins are established and develop naturally out of JAN 8. The six-legged, rabbit-eared Victory, with its accompanying central bead between the legs, and the developed legends, follows directly those of JAN 8. The obverse portrait is dominated by a large, almost vertical diadem which separates the frontal triangle of hair above the forehead from the curving wild hair in the back . The head is therefore assuming the Leovigild type (Miles Type H). The chest is the major variable and motif determinant of the group. It is trapezoidal, with pointed shoulders. Its contours are achieved in round beads of either two or three rows to each side. The confines of the central pectoral cross area are echoed by a pattern of repeating semi-circular lines that are in either one or two rows. This creates a rich decorative effect , which is not found on the coins of JAN 8. The contours of this pattern however are those of JAN 8.

### GROUP C 2

(PLATE XXX, 560–567)

These coins follow exactly those of C 1 with the exception of two aspects. The first is the development of the shoulder line of group C 1 into epaulette-like fibulae. The second is the inclusion of the cross in the middle of either the obverse or reverse legend or in both in some of the specimens. Aside from these exceptions, coins






of C 1 and C 2 are similar in types, weights, fabric, and legends. It would seem most likely that they are either contemporary issues of the same mint, or earlier and later issues of the same mint.

### GROUP C 3

(PLATES XXX-XXXII, 568-592)

The Leovigild VPW tremissis is almost resolved in some of these coins. They follow in legends and fabric C 1 and C 2. The C 1 and C 2 types have been further developed or varied in the direction of ever-increasing proximity to Miles Type H. The diadem has been vertically placed, and the chest has been simplified. In what may be the first examples of this group (PLATES XXX-XXXI, 568-573) the chest continues to have the three round beaded borders, but the epaulettes of C 2 have become round fibulae like those seen in JII 5, and the decoration of the pectoral cross area has been reduced to a curved line facing each of the four corners. The resolution is completed when the third beaded border is removed and the final Leovigild VPW tremissis bust and chest is achieved.

A development may also be seen in the Victoria, in which the final insect Victory is perfected. The six legs of the Victory in C 1, C 2 and in the early examples of C 3 (the three beaded bordered coins described above) are handled in this manner: . Within this group it is possible to trace the change to this , which almost arrives at the final step, the INCLITUS REX Victory .

The only other variable aspect is the lower scale of weights in contrast to the good standards found in C 1 and C 2. In this respect as in all others, however, C 3 leads directly to the INCLITUS REX issues.

### GROUP C 4

(PLATE XXXI, 593-595)


The variables here are important enough to suggest a different mint product in the manner of the C 3 group. The obverse portrait is the same except that the decorative curving lines have been

removed. The Victory figure has almost lost its head, or it has become confused with a V in the legend. The figure is much more of the stick type and has only four legs. Furthermore, the whole scale of the coins and thereby the types is smaller. The fabric also differs as well as do the legends which read DVDVTV + IVTV on the obverse and VISΔIVIIQMAI on the reverse. The three coins weigh 1.27, 1.34, and 1.40 gms., and Cabré classified the Zorita coin (PLATE XXXII, 595) as made of "oro bajo."

It would seem unlikely that this comes from the same mint progression as C 1, C 2, or C 3 and may be the product of one of the mints that produced the earlier two, three, or four-legged Victories.

### GROUP C 5

(PLATES XXXII-XXXIII, 596-602)

These coins follow precisely the Victory and chest types of C 2. The legends, fabric and weights are all good, with the exception of the very low Zorita item (PLATE XXXII, 598). The variation is in the portrait head which uses a flat-topped or horizontal diadem and hair standing vertically up from it. In two examples we get a variant that brings the head closer to the C 3 type , by describing the aspect of the frontal lobe. This seems to paraphrase the type of JAN 4 and the coins of JAN 4a, particularly No. 331 (PLATE XVI). This group may then be considered a product of the JAN 4 mint imitating the "curru" standard of JAN 1-JAN 2-JAN 8.


One final "curru" coin which may or may not be connected with this group is No. 602 (PLATE XXXII). This is a crude example. The chest type is a square version of C 3, and the border is composed not of round beads but of triangular punches that have been seen on coins of Group JII 4, which was also traced out of JAN 4. Besides this, the head is composed of a diadem that diagonally meets the forehead, and the hair behind this rises vertically in slight curves. Where the diadem meets the forehead contour, however, there is a second line parallel to the forehead contour which gives the impression of the beginning of the frontal lobe found in all "curru" portrait

heads. The Victory figure is six-legged and roughly rabbit-eared but placed askew in relation to the exergue.

#### INCLITUS REX

(PLATES XXXIII-XXXIV, 603-630)

With this group bearing the name of Leovigild on the obverse and the legend INCLITUS REX on the reverse, the last step is reached in the development of the VPW tremisses. It follows directly from C 3 and illustrates the perfected or resolved abstract design of both obverse and reverse types. These are also the types that are found on the coin catalogued by Florez in which the name of the mint, Toledo, has replaced that of INCLITUS REX on the reverse.

This final design is totally two dimensional. All is reduced to line except for two areas of modeling which in themselves have been abstracted, flattened, and thereby stylized. The first area is the cigar-shaped or carrot-shaped body of the Victory; the second, the modeling of neck, cheek and jaw which becomes a single raised mass of this shape . All this is in order with coins of C 3. As already noted in the discussion of C 3, the only change observed in this issue is in the pattern of the six legs of the Victory which now form three lines parallel to each other at 45 degree angles to the body on each side.

The obverse portrait continues on the Leovigild cross-on-steps issue. It appears again when revived on the cross-on-steps issues of Reccesvinth (Miles 360a, b, c) and makes its final appearance on an Egica issue from Taracona (Miles 427a).

#### HERMENEGILD ISSUES

Coins bearing the name of Hermenegild are exceedingly rare.<sup>7</sup> The number of forgeries within this small group might make one suspicious of even the accepted authentic coins and to doubt that Hermenegild ever issued a coin. Regardless of the small number extant, nevertheless, the few pieces accepted as authentic are genuine and

<sup>7</sup> Reinhart, *DJN* 1940, p. 85. Reinhart knew of only three authentic items.

do fit into the stylistic pattern and fabric of Visigothic coins. Of the seven coins listed by Miles, one is lost, another has been stolen and is only known through a photograph,<sup>8</sup> another is a forgery (which he correctly suspects), and another which he does accept is very questionable and most likely another forgery.<sup>9</sup> Of the three remaining, all are of the same type and design although the legends vary.<sup>10</sup>

## H 1

## (PLATE XXXIV, 631)

This group contains a single coin. It bears the name of Hermenegild on the obverse and the legend INCLIT I REX on the reverse. This coin which Miles has accepted as authentic has been described by Grierson as a cast and consequently a forgery.<sup>11</sup> Whether it is authentic or not, it does not belong to the same stylistic group as Hermenegild's two other INCLITUS REX coins as Miles suggested. It is of diverse design type. Its stylistic origins are complex, having associations with coins of JII 3, JII 6 and JII 7. The obverse chest type presents another variation of the large JII 5 group which also has been imitated in item 477 of JII 3a and in all of the items of JII 6. The portrait head, however, is closer to the fine plastically modeled heads of JII 3 and JII 7 than to those of JII 5 or JII 6. The Victory on the reverse is developing the insect type seen on JII 5 and may mark an attempt of the style groups that relate to JAN 5 to design an insect Victory type which is not a part of their stylistic tradition. A similar attempt is seen on the reverses of JII 7. The stylistic relationships as well as even similar weight standards would most strongly connect this Hermenegild series to the already established JII 3, JII 6 and JII 7 groups and might attest the authenticity of this Hermenegild example. I must agree with Grierson, however, that "... the weight is too high for a coin that pretends to be badly worn"

<sup>8</sup> The lost item is Miles 47 (d), and the stolen one is Miles 47 (a), or, my no. 634 (PLATE XXXIV) from Mateu y Llopis' catalogue of the Madrid Collection.

<sup>9</sup> Miles is suspicious of the Johns Hopkins item, Miles 47 (c). However, he accepts the Hispanic Society of America item, Miles 46 (a), which I reject (PLATE XXXIV, 631).

<sup>10</sup> These are the following: no. 635 (LBM); no. 632 (PBN); no. 633 (VQR).

<sup>11</sup> This judgment comes from Grierson's unpublished manuscript.

and that "... the lettering is unsatisfactory...".<sup>12</sup> The complexity of its style, furthermore, does not fit into the regular patterns of development. It is too much of a conglomeration.

## H 2

(PLATE XXXIV, 632-633)

The two specimens placed in this group exactly duplicate Leovigild's INCLITUS REX series except, of course, for the different royal name on the obverse. There is no reason to question their authenticity. Grierson is correct in noting the diversity of the letter formation of the two coins of this group from those of the H 3 REGI A DEO VITA series.<sup>13</sup> The letters here are generally smaller and cruder. Punches are used exclusively. This is particularly seen in the letters R, D and E. In group H 3 the letters are larger, and the use of punches is combined with free-hand strokes to enhance legibility.





## H 3

(PLATE XXXIV, 634-635)

These represent the REGI A DEO VITA coins in the name of Hermenegild. Miles lists four, of which two have disappeared, and another, the Johns Hopkins example, is a forgery. The British Museum specimen is an exact imitation of the INCLITUS REX series of Leovigild, and there is no reason to question its legitimacy. On the basis of a photograph, the "stolen" Madrid item may safely be accepted. The Johns Hopkins example, which Miles considers as being suspicious, is unquestionably a forgery. There is not a coin in the entire VPW series designed and modeled in this way. Two aspects are immediately noted; first, the treatment of the neck and jaw region of the portrait head; second, the treatment of the lower torso of the Victory. On all of the "curru" and Leovigild INCLITUS REX coins, although the portrait head has been worked completely in line, the area of the neck and jaw still retains a remnant of the traditional modeling in the characteristic inverted "L" shape or the shape of a






<sup>12</sup> These quotations are taken from Grierson's unpublished manuscript.

<sup>13</sup> Op. cit.

side-wise "T"  or . Only two graceful sweeping lines  form the neck and chin of the Johns Hopkins coin. This is the only coin of all that have been studied that introduces on the insect Victory a pattern of three short lines in the region customarily occupied by genitalia on a male figure. If genitalia are intended, then in the course of seventy-five years the sex of Victoria has changed. In addition, the design for the palm branch is unorthodox , as well as the treatment of the dot between the legs, which here is a ring or amulet punch rather than the usual bead. These characteristics combined with the different way in which the letters of the legends are formed, cause me to believe that this is a forgery. This leaves very little for Hermenegild, but what is left is authentic.

#### H 4

(PLATE XXXIV, 636-637)

The two coins which make up this group are both in the collection of the Gabinete Numismático de Cataluña. Although they bear the REGI A DEO VITA legend of group H 3 and a similar obverse portrait chest and reverse insect Victory, there are design differences. The obverse portrait is a variation of the norm established on the INCLITUS REX issues. It possesses all the elements of the INCLITUS portrait, but the manner of execution is quite different. Here there is a greater use of modeling. The neck is a slightly raised, flat, even plane on which the head sits in higher relief; the features are evenly presented and, although wearing is indicated, the contours of nose and lips could never have been the linear forms of the INCLITUS REX type. The legible, broad, flat letters are very similar to the treatment of the modeled face and its features. The insect Victory varies slightly in the way the head is formed  rather than the  of the INCLITUS REX, and in the attachment of the wings to the body  rather than . There are also three graduated lines for the exergue  rather than the single one of all other types. Only the

Johns Hopkins specimen which I have considered a forgery has this same peculiarity. A final eccentricity is the correct formation of the letter A. The distinctiveness of these two coins must be accounted for by either a different mint production than those of H 2 and H 3 or as forgeries. The latter explanation seems the most likely because these coins give the impression of having been designed by a man attuned to a more realistic aesthetic background attempting to simulate an abstract form created by an individual not realistically orientated. A final proof that one of these coins, if not both, is false is the abnormally high weight (2.247 gms.) of No. 636. This would be unique in Visigothic coinage.

## OBSERVATIONS ON STYLE GROUPS AND PROGRESSIONS

An analysis of the style groups and progressions and the manner in which abstractions develop should provide more material of a less circumstantial nature for the solution of problems of mint attribution and mint practices. The anonymous nature of the coins by their lack of any definite identifiable mint mark, symbol or letter, however, makes it impossible to offer conclusions that are more factual than hypothetical, even when they are classified on the basis of stylistic similarity. Considerations and judgments of style, no matter how carefully structured, are at the final moment the responsibility of individual subjectivity, if not fantasy. I do not consider myself immune to such eventualities.

When reviewing the classifications of the VPW tremisses from Anastasius to Leovigild, certain factors become apparent on the basis of which a number of hypotheses may be suggested to provide a structure for mint attribution. Such factors may be classed in the three categories of design style, inscriptions, and weights. The full interpretation of all these observations depends on the reconstruction of sixth century mint practices, which in turn is determined by the analysis of these factors.

### STYLISTIC FACTORS OF DESIGN

1. The observation of primary importance, formed by a study of Chart VIII which is a visual projection of the style group relationships spelled out in the preceding chapter, is that the majority of the groups is related to definite Visigothic Leovigild coins. From this I suggest that all such major groups must be products of Visigothic mints. It must also be concluded by virtue of quantity that the Visigoths were primarily involved in the issuance of the VPW.

2. The number of groups within the Visigothic orbit increases as we proceed from Anastasius to Leovigild. There is also an increasing



number of variables within each group. Simply, Visigothic coinage within this period moves in the direction of greater complexity and confusion. This is true for legends and weights as well as for types. There are, however, general consistencies among contemporary groups within each imperial reign. There are similarities in aesthetic directions and motivation. These consistencies override the boundaries of the lines of developmental progressions. All the Anastasius groups share in their predominant maintenance of naturalistic effects, while moving in the direction of geometric simplification. All the Justin I groups share in the continuation of these practices which are completed in the Justinian groups. The geometric, two-dimensional stylization of the chest is achieved in JAN 2 and JAN 5. By the time of Justinian the cross-on-chest motif becomes universal in Spanish coins. All the Justin II chest types are in order with their square or trapezoidal contours.

The consistencies within the development of groups and within and outside of the ranging stylistic progression series are extremely important in establishing the general boundaries of what must be considered Visigothic coinage. They assist in the establishment of aesthetic principles by which Visigothic issues may be distinguished from non-Visigothic. It is not possible to determine whether these consistencies in aesthetic attitude are due to centralized official policy, common sources of origin, or mutual regional influences.

The increasing number of groups and the existence of groups which do not follow directly the style progression of Justin I groups such as JAN 4, JAN 5 and JII 3 might be a manifestation of the political confusion and breakdown after 550, and the struggles against the Byzantine forces and the Suevians, as well as the orthodox Hispano-Roman population. At the same time there is an increasing possibility of Suevian imitations of Visigothic coins, unofficial mint products, as well as Byzantine issues and their influence, such as evidenced in JII 3. Concomittant with this is the transition of the Visigothic State from French to Spanish with settlements spreading increasingly further south into the peninsula and necessitating the moving of the capital to the south. From Amalaric to Leovigild there is increasing political and fiscal control of the peninsula by the Visi-

goths. This expansion, as well as the moving of the capital, might have caused the establishment of a larger number of mints.

3. The increasing development towards uniformity, visible in JII issues, even notwithstanding the naturalistic innovations of JII 3, as well as the establishment of the "curru" issues, might indicate the increasing strength of the Visigoths and a stronger control of monetary practices under Leovigild. Leovigild's unification and standardization of mint products and practices as indicated in his cross-on-steps reverse and facing busts issues is seen in its early stages in the "curru" and INCLITUS REX series. This is indicated by stylistic groups in which more than one mint is involved in the issuance of "curru" coins (C 4, C 5, JII 5a are each separate from the mint of C 1, C 2, C 3). Such a policy was justified in light of the variety of coins in the groups without mint marks in the time of Leovigild.

4. Stylistic progressions may be arranged so that Leovigild types may be traced back to Anastasius issues. This stylistic development or the development of the Leovigild abstract forms out of the naturalistic ones of Anastasius results naturally from the combination of the aesthetic desire for simplification and the technical need for facility. The INCLITUS REX issues, although apparently of short duration, represent the successful resolution in which aesthetic principles are satisfied within the limitations of technical abilities. Thus really crude renderings in design types are avoided.

It must be understood that usually a stylistic program does not necessarily establish a correspondingly chronological relationship. The grading of a design on the developing scale from naturalistic to abstract form does not signify that all more abstract forms date later than non-abstract forms. It is always possible that such diverse styles might be contemporaneous, and that these progressions are to be read horizontally rather than or as well as vertically. In the material under study, nevertheless, there is a distinct chronological order in direct relationship to the process of abstraction from group to group. Evidence for this is as definite as possible in such a sub-group as JI 1 d, where the transition from a Justin I legend to a Justinian legend is achieved. The chronology of developing related groups may be clarified further by understanding that when enough material is available to permit the formation of a general gradual style

11\*

progression from the parent group to the descendant one, a corresponding chronological order may be imposed. When transitions are not extant between two groups such as JAN 1 and JAN 2, and a third group such as JAN 8 depends and develops from both, it is perhaps more correct to see both early groups as being issued horizontally in the scale rather than vertically.

This qualification should be extended further in consideration of mint attribution. Diverse stylistic progressions do not necessarily imply different mints; they might be explained as different moneyers of the same mint. The interpretation of the material, however, reveals a definite indication that different progressions imply different mints. The difference in designs and legends are often too consistently distinguishable to be products of the same mint. This is particularly noted in the hesitancy for the progression of A 4-JI 2-JAN 3 to adopt the pectoral cross which has been a permanent motif on the A 1-JAN 1 progression as early as A 3.

5. Stylistic correspondencies exist outside the realm of Visigothic numismatics and are observed in earlier fifth century imperial issues, and in Ostrogothic, Frankish, Burgundian and contemporary Byzantine issues. The Anastasius issues, for example, proceed naturally from late fifth century examples attributed to Italian and Gallic mints. There is a marked connection between A 1 and A 3 portrait heads and those on tremisses of Valentinian III, Avitus, Majorien, Leo, Julius Nepos, Romulus Augustus, Zeno and Basiliscus attributed by Ulrich-Bansa to Milan,<sup>1</sup> while coins of the same period attributed to Ravenna and Rome are connected more with A 2 and A 4.<sup>2</sup>

The importance of the Ostrogoths in western Europe is indicated by the large quantities of their money found in France and Germany.<sup>3</sup> Just as the gold issues of Italy and particularly Milan must have spread over Gaul and the rest of Europe in the fifth century, so did the Ostrogothic issues in the last decade of the fifth and the early sixth. Possible proof of our earlier established theory of Ostrogothic connections with the conception of the Anastasius VPW issue is the

<sup>1</sup> Ulrich-Bansa, pls. X, XIV, XV, XXI; for Group A 3, see pl. XV, 191a.

<sup>2</sup> Ibid., pl. O; *BMCVOL*, pl. V, 17-21, pl. VI, 4.

<sup>3</sup> Le Gentilhomme, *RN* 1943, pp. 88-90.

continuing stylistic association of such groups as A 2, A 4, JI 2 and JAN 3 to Ostrogothic issues.<sup>4</sup> This Italian connection is continued in Byzantine Imperial issues from Ravenna and Rome and is noted between JII 3 and silver coins of Justin II.<sup>5</sup> The square chest types developed also in Athalaric's Ravenna Justinian issues,<sup>6</sup> and the many coins of Theia with broad chests of gracefully flowing folds do recall some of those of JI 2 and JAN 3.<sup>7</sup> Ostrogothic connections seem much more influential in the coins of the progression of A 2-JI 4 and A 4-JI 2-JAN 3.

Burgundian issues, mostly with royal monograms, are of a different type from all of the Visigothic. This is manifested most immediately in the Victory figures which never lose the modesty of their gown nor the bottom hem which prevents folds from becoming extra legs. It is further indicated by the portrait bust which cannot be stylistically grouped with any of the coins of my groups. Burgundian coins bear the closest resemblance to coins of A 2-JI 4 and A 4-JI 2.

Merovingian coins become crude or resort to symbols and royal mint monograms or geometric abstract patterns so immediately that it is difficult to see any connection with coins of my groups. Since letters in the field are not in the tradition of Visigothic coinage, it may be assumed that those with such letters are Merovingian. They also are found almost exclusively on coins whose style would place them with the A 1-A 3-JI 1 group. Since these groups follow closely the fifth century issues of Milan and those of Gaul, it would not be too rash to conclude that this style descends immediately or directly from the mint products of Visigothic Toulouse before 507. Consequently, this style would have been widespread throughout Visigothic Gaul and easily continued by mints now operated or newly organized by the Merovingians. It would also be in character and traditional for this region to copy coins issued by the new Visigothic capital of Narbonne, and it would be natural for Narbonne to continue the types of Toulouse.

<sup>4</sup> *BMCVOL*, pl. VII, 4; pl. V, 17-21; pl. VI, 4; pl. X, 17-18.

<sup>5</sup> *Ibid.*, pl. XVII, 25-31.

<sup>6</sup> *Ibid.*, pl. VII, 23.

<sup>7</sup> *Ibid.*, pl. XII, 9-12.

The majority of coins bearing Victories in the Visigothic insect manner in the name of Anastasius, Justin I, Theodebert, and Childebert I all bear a T or TΛ, or TΔ or TS in the field. These have been questionably attributed by Belfort and Prou to Toulouse, Toul, Troyes and Treves.<sup>8</sup> Yet all other VPW's in the Prou and Belfort catalogues are of the non-insect type with squarish contours to their robes; standing rather than striding figures; with a pronounced bent arm holding a wreath; and often with the palm branch deleted. Coins of this type are noted in the names of Anastasius and Justin I, bearing the monograms of Gundibald, Sigismund and Gundomar. They also appear with the names of Theodebert and Childebert I. Belfort has given these to Lyons along with some of the Theodebert issues which bear an LV in the field.<sup>9</sup> Some of Justin I with *MR* or *NR*, or PR in the field have been assigned by Belfort to Narbonne; however these are the same as those I have grouped with the Burgundian issues.<sup>10</sup> A number of those in the name of Theodebert bear a possible NR in the field or a monogram *NR* or an N, which Belfort has given to Narbonne.<sup>11</sup> The Narbonne-Merovingian attribution is out of the question, however, since Narbonne is a Visigothic city at this time.

It would seem that in the Merovingian coinage of Theodebert we have at work the influence of both Burgundian and Visigothic traditions in the distinctive representation of the Victory figure. The Visigothic Victories are found only with the letter T, alone or in combination with another letter; while the Burgundian Victories are found with letters LV, NR, N or *NR*. This factor combined with the stylistic consistencies revealed in this study would indicate: (1) Frankish usage of letters in the field to identify mints; (2) Burgundian preference for royal monograms in the field which is replaced by the mint letters under the Franks; (3) further evidence to justify the

<sup>8</sup> Belfort, nos. 2292, 2295, 4327, 4355, 4356, 4357, 4359, 4479, 4483, 4360, 4361. Also see Prou, p. 500, no. 2433; p. 124, nos. 534, 535, 537. On the last coin which Prou lists as from Nantes (?), there is a blurred legend, a VPW, and the large letters of N S in the field.

<sup>9</sup> Ibid., nos. 2289, 2291, 5475-5488, 5492-5493; also nos. 2259, 2260, 2272, 2274, 2277.

<sup>10</sup> Ibid., II, p. 413, nos. 3137, 3138.

<sup>11</sup> Ibid., nos. 2293, 5881, 5882, 5883.

removal of all coins with *M* monogram variations erroneously associated with Narbonne and with Amalaric from the lists of Visigothic coinage; (4) the Visigothic Victories in association with letter T may very well indicate Toulouse. These Visigothic Victories on Merovingian coins of Theodebert with letters in the field may substantiate the inclusion of the coins bearing mint letters in the field and associated with Visigothic groups as Frankish variations and copies.

6. Stylistic correspondencies between Visigothic coins without mint names and later ones with mint names significantly reveal aesthetic continuities. The uniformity and standardization particularly of the coinage of Leovigild and Reccared, however, make it difficult to distinguish any specific mint characteristics that might have carried over from the anonymous period. My groups do relate positively and generally to the later national coinage and consequently are unquestionable parents. In order to attribute anonymous issues by comparison with later coins with mint names, a thorough investigation must be made in order to find out whether Visigothic mints maintain or possess a specific, individual character. The results of such an investigation are insufficient in themselves but combined with other material may increase the weight of circumstantial evidence.

7. A study of French and Spanish collections and their inclusion in these groups affords illuminating observations (See Chart VII). The coins in French collections decrease in number as one goes from Anastasius to Leovigild; while coins in Spanish collections increase in number from Anastasius to Leovigild. This reflects the shifting of the center of the Visigothic authority from France to Spain, specifically after 507. The largest collection of Anastasius issues is in the Cabinet des Médailles in Paris, and this is true for each of the Anastasius groups as well as for the entire period. This is equally true for coins of Justin I. It continues to be true for only one Justinian group, JAN 1. Although the Cabinet has a similar number of coins in JAN 2, it is topped by New York, London and Madrid collections. An analysis of those coins which have been so far reconstituted to the Gourdon and Alesia Hoards indicates a similar behaviour pattern to the total Paris collection in the Anastasius and Justin I periods.

The study of the collection distribution of these coins further indicates that coins with letters in the reverse or obverse field are to be found in the largest number in the Cabinet des Médailles, while one has never been recorded in the Madrid or Barcelona collections. The Zorita Hoard is void of any coins with letters in the field. Visigothic coinage from Justinian forward maintains barren fields. This seems to be a further indication that all coins bearing letters other than royal monograms are Merovingian. This custom is particularly seen in the Anastasius period. Letters in the field are less used in the period of Justin I and this then designates a Merovingian coin of Visigothic type. Its rarity after Justin I on VPW tremisses indicates the termination of the striking of Visigothic imitations by Merovingian mints.

In analysing further the character of coins of groups in the various major collections, it is found that the largest number of variables is in the PBN and forms a large part of the few coins traceable to the hoards of Gourdon and Alesia. Spanish collections have a smaller number of coins represented in variable groups even though the Zorita Hoard contains some very crude versions. The study of the variables may aid in distinguishing Visigothic from non-Visigothic imitations.

8. The Zorita Hoard provides the one opportunity to study and analyze coins which may be associated with a definite location of usage. The coins date from Justinian to Leovigild and consist of eleven tremisses of Justinian, sixty-four tremisses of Justin II, five "curru" tremisses, three INCLITUS REX coins; and six non VPW tremisses (five Merovingian [?] and one Suevian [?]). Of the five VGC coins assigned by Cabré to the Merovingians, I would suggest that Zorita no. 5 (PLATE D) is close to the Hispano-Byzantine products of the mint at Cartagena, described by Grierson, and that Zorita nos. 3 and 4 (PLATE D) may be unofficial Visigothic imitations of these Hispano-Byzantine products.<sup>12</sup> There is a stylistic relationship between these coins and those of Groups JAN 3, JAN 4, JII 3 and JII 4 which will be assigned to Andalucía. These are not Merovingian.

One of the Zorita VPW items (no. 657) which has been classified by Cabré as questionably Merovingian is an anomalous coin whose

<sup>12</sup> Grierson, *NH* 1955, pp. 313-314.

style fluctuates between JAN 3 and JAN 4 and whose inscription in exergue  $\overline{\Lambda C \overline{\Delta} \Lambda}$  may have something to do with the unique exergue  $\overline{\Lambda \overline{\Delta} \overline{\Delta}}$  to be found on two JII 4 Leovigild coins (PLATE XXV, 486–487). A Merovingian attribution seems incorrect since it does not seem to attempt an exact copy of a Visigothic issue, and its style and type variation is too much within the aesthetic orbit of all the coins studied and classified within the Visigothic series.

The Zorita Hoard is almost solely responsible for the two groups JII 2 and JII 3 and accounts for half of the extant Justin II coins catalogued. An intriguing aspect of the hoard is the preponderance of crude examples of groups strongly represented in existing collections, such as JAN 2 and JAN 5, and the large number of variations within groups. The dominance of JII 2 and JII 3 types would encourage a local mint attribution that is somewhere in the Carthaginensis; however, Zorita is well enough situated on commercial roads to permit coinage to be represented from all over Spain. Zorita, northeast of Toledo, is up the Tagus from Toledo on the road into the Tarraconensis, Saragossa, Tarragona, Barcelona and then Narbonne. At Toledo, that road forks south to Córdoba and Seville and southwest to Mérida and Evora. Such a group as JII 6 consists of only Zorita items, while the non-Zorita coins of JII 7 are only vaguely and questionably related to the Zorita JII 7 coins. Both groups may be even more definitely local mint products. A study of the Zorita makes possible consequent observations concerning mints in the pre-Leovigild era. Such observations cannot be so definite as one would hope.

#### LEGENDS

The legends bear a direct relationship to stylistic progression so that in almost every case coins may be dated in accordance with the emperor's name they bear. Justin I legends are distinguished from those of Justin II by their greater accuracy of execution. This is further substantiated by the distinctive stylistic variations in the design of the types. A study of the legends in connection with a study of type styles places the garbled legends in the late Justinian and Justin II groups, so that it is possible to see consistency within



imperial reigns, as well as consistencies between groups within style progressions such as A 1 to JAN 1.

Variations between groups of different style progressions, however, are not significant enough to be sole determining factors in the cataloguing of individual coins, although the manner of inscribing the legends and its orthography do provide subsidiary circumstantial material in reconstructing a group personality. In this regard the reverse legends are perhaps more telling, particularly in the last half of the period. Those of JAN 4 and JAN 5, for example, reveal the distinctive character of each group; while the stylistic associations of JAN 2, JAN 6 and JAN 7 are paraphrased in their legends.

When the garbled legends are analyzed, two tendencies manifest themselves. On one hand there is a natural derivation of these legends from correct ones by way of technical shortcomings in reworking old dies, or in transcribing, or in copying worn coins, or in the use of punches. On the other hand, the national aesthetic takes over. It is immediately seen how quickly the D of Dominus Noster becomes a  $\mathcal{D}$ , once the first letter of the obverse legend becomes confused with the contour line of the imperial chest; or how, in small lettering, the diagonal sections of the letter N can become confused with an H or incorrectly formed as an  $\mathcal{N}$ , or finally  $\mathcal{H}$ . Nor is it difficult to understand how the reverse legend becomes increasingly abbreviated because of the growing inability to place the full legend VICTORIA AVGVSTORVM on the coin. The handling of the reverse legend is further complicated by its being confused with the common reverse legend for the Byzantine solidus, VICTORIA AVCCC. It is this association which produces reverses like those of JII 7 (nos. 539 and 540) and JII 3a (no. 467). The greater variation would naturally occur in the reverse legend where the skill of the die cutter is challenged by a serious technical problem. The reverse type and legend are far more demanding of delicate craftsmanship in order to fit on the coin. The enlargement of the Victory figure in order to include more aspects of its character impinges on the area of the legend and thereby necessitates the execution of small, more delicate letters for the legend. There seems to be an increasing inability to create these.

The increased use of punches is directly proportional to the increase in garbled legends in Justinian and Justin II issues. This is


indicated by coins in groups JAN 2, JAN 7 and JII 4, e.g., nos. 271, 273, 367, 377, 380, 478, 479, 482, 483. No matter what the means, once the legends are so garbled as to become unintelligible, they are inseparable from the mintmaster's concept of total design. Almost immediately the elements of symmetry and pattern take command in the organization of the letters of the legend. This development may be seen in such legends as those of JAN 8, JII 4 and JII 5. What is apparent is that garbling cannot be accounted for by the illiteracy of the die maker or of the manager of the various mints; otherwise the minter could not have handled so easily the name of Leovigild and the mint in the national coinage. The blurring of legends may be accounted for by either technical or consciously political reasons or both. In either case, it is not a difficult or impossible transition to nonsense legends symmetrically designed or organized. "Curru" legends are explainable as the culmination of a developed, conscious pattern of letters arranged in a meaningless but aesthetic pattern. The pattern is immediately replaced once Leovigild feels strong enough to assert his independence and dynastic right.

It is interesting to note that the coins of the A 4-JI 2-JAN 3 progression and subsidiaries such as JII 1-JII 2-JII 3 provide us with the most intelligible and accurate rendering of legends. These are groups also influenced more strongly by both Ostrogothic and Byzantine issues, and for the late JII groups it might suggest their being products of mints under Byzantine control. On the other hand, garbling proceeds rapidly and reaches its final aesthetic form in the production of the "curru" legend in the A 1-JI 1-JAN 2 progression.

#### STARS AND CROSSES

Crosses and stars appear in the obverse and reverse legends of some of the coins studied, but it has been impossible to interpret any significant relationship or consistency in their use. The use is scattered throughout groups in all of the several progressions. The use of the cross is more common and is found predominantly in the middle of the obverse legends (A 1, A 1c, A 1e, A 3b, A 4b, JI 1, JI 1c, JI 2, JAN 3, JII 3, C 2, C 3, C 4, IR). Its use in the reverse

legend is relatively rarely found (A 4a, JI 1b, JI 2, JI 5, C 2, C 3). Stars are found much less frequently and equally avoid significant interpretation (stars in obverse legends of JII 3; and one item in the reverse legend of JAN 8).

The presence of a cross or a star in the reverse or obverse field is found infrequently in coins that might enter the Visigothic category. There is only one coin which bears a cross in a field, and this is on the obverse. It is the unique No. 205 (PLATE X-JI 2a) which is very questionably included in the Visigothic orbit and seems more likely a Merovingian product. The use of stars in the obverse field is found in conjunction with the monogram  of Justin I and Justinian and with the  $\varsigma$  of Justinian. All these are Burgundian. In a coin of the Gourdon Hoard, the star alone appears in the reverse field. This and one formerly in the Reinhart collection, (PLATE IX, 192) are both of JI 2, while another from the Alesia Hoard is a JI 2 variation, possibly non-Visigothic (JI 2b). A star appears one more time on the reverse field of a JI 3 variation (JI 3a) which is stylistically unique and impossible to place in any one group with certainty. Grierson has assigned a number of VGC coins to his Hispano-Byzantine mint at Cartagena, which have stars in the right reverse field. This may account for the sporadic appearance on the few Visigothic pieces.<sup>13</sup> A study of the rare appearance of stars or crosses in the obverse or reverse field has failed to reveal any pattern to permit interpretation.

The pectoral cross, one of the more distinctive features of the Visigothic VPW tremissis, has never been explained adequately. Its occurrence on a coin minted in Spain should not come as a surprise, since the cross is the most recurring decorative motif and religious symbol in Spanish art of the Visigothic era. As a political and propaganda measure, Reinhart suggests that the cross, a more orthodox than Arian symbol, is a concession of the Arian kings to their orthodox subjects.<sup>14</sup> The Arianism of the Visigoths convinced Reinhart, as has been noted before, that this was a Frankish innovation at Toulouse, adopted by the Visigoths. Florez, however, explained that it was the Arian veneration of the cross that was

<sup>13</sup> Ibid., pp. 308-309.

<sup>14</sup> Reinhart, *Germania* 1941, p. 193.

behind the use of it on the coins.<sup>15</sup> Arian or orthodox, the devotion to the cross is an important early development in Spanish liturgy, and its place on the coin is an expression of this. Even the *Lex Visigothorum* prescribed the Invention of the Cross (3 May) as one of the principal feasts of the year.<sup>16</sup>

Not discounting the religious significance, it is worth considering whether another explanation may be supplied for its presence on the tremissis bust portrait. Is it simply a realistic descriptive observation? Was the cross part of the imperial or royal regalia? Was a pectoral cross worn by the Visigothic king? The Visigothic treasures of Guarrazar and Torredonjimeno make such a suggestion strongly probable, since they are composed of sceptres and royal seals as well as diadems and crosses.<sup>17</sup> The pendant cross on the offering crown of Reccesvinth seems particularly to have had a separate function of its own previously as a cross hanging on a chain around the neck.<sup>18</sup> Stronger evidence may be the testimony of Al-Maqqarī (amongst other Arab chroniclers) who said: "...for it was a custom among the Gothic sovereigns of Andalus that the diadem worn by each of them during his life should after his death be deposited in the principal church."<sup>19</sup> The first appearance of the pectoral cross on the Anastasius VPW tremissis (nos. 2 and 3) is as a brooch pinned to the paludamentum. That such crosses were worn and that the custom was more common in the East with both laity and clergy enhances the possibility of a similar custom being popular in Spain which so often followed Eastern usages.<sup>20</sup> That a pectoral cross may be a

<sup>15</sup> Florez, III, p. 173.

<sup>16</sup> *Lex Visigothorum*, lib. XII, tit. III, leg. VI. Spaniards have attributed many of their victories over the Moors to the power of the cross, e.g., Novas de Tolosa (1212) and Oran (1509). Alfonso III gave the cross of Oviedo and Santiago in 874, as a victory offering and gave another, the "Cruz de la Victoria" in 908, bearing the inscription: HOC SIGNO TUETUR PIUS. HOC SIGNO VINCITUR INIMICUS. See Schramm, II, pp. 482-483.

<sup>17</sup> Menéndez-Pidal, III, p. 215.

<sup>18</sup> Ibid., p. 627.

<sup>19</sup> Maqqarī, I, pp. 282-283.

<sup>20</sup> Seymour, p. 251. The earliest wearing of a cross on a chain around the neck may be that worn by Pope Hilarius in 461. Gregory the Great wore a cross, and Justin I (519) gave a pectoral cross to the Pope. These may have been talismans of the True Cross, for a Theka with relics was worn by Gregory the Great, Gregory of Tours, and later Charlemagne. See Schramm, p. 310.

part of the regalia may be indicated by the gifts placed in St. Peter's grave by Liutprand on a visit to Gregory II (715-731). They are said to have been a mantle, vestment, sword belt, crown and silver pectoral cross.<sup>21</sup> At his coronation in 962, Otto I wore a pectoral cross.<sup>22</sup>

A pectoral cross, therefore, may already have become associated with the royal apparel in the sixth century, and its presence on the coins may simply indicate this. The bronze issues of Theodahad further bear this out.

#### WEIGHTS

Evidence derived from the weight of the coins studied has limited application. Some style groups are composed of too few coins, e.g., JI 5, JAN 6, JAN 7, JAN 9, JAN 10, JII 1, JII 6, C 4. This is further compounded where such a small group contains coins whose weights have not been recorded, such as in JI 5, in which the weight of only two of the four coins is known to me. Nevertheless, a study of the Weight Charts X and XI and their accompanying graphs, X a, X b, XI a, XI b, does provide material for provocative and applicable observations.

Similar developments may be seen in the study of weights as in that of design. A degree of regularity in the average weight in the largest weight group may be traced from Anastasius to Justin II. As style groups become more numerous down to Leovigild, so does the variety in the weight of the individual coins in a group. Style, weight and quality of gold will be standardized by Leovigild's currency reforms. However, until the period of Justin II, the weight standards were well maintained and varied much less than did the type designs. Considering only the weights of the coins in the major groups (Chart X and Graphs X a, X b), the standard fluctuates through 1.42-1.48 gms., with the exception of groups JI 5, JAN 7, JII 1, JII 2, JII 6, C 3, C 4 and IR. JI 5, JAN 7, JII 1, JII 6 and C 4 are very small groups, and the number of coins here is insufficient to make the evidence of their weight averages valid or interpret-

<sup>21</sup> Duchesne, *Lib. pontif.*, I, p. 408.

<sup>22</sup> Schramm, p. 311.

able. Since JI 5 can be definitely assigned to the Burgundians, only three style groups remain which are large and have a majority of coins of poor weight: JII 2 (1.096), C 3 (1.288), and IR (1.309). The widest variance occurs consequently in the period of Justin II and the early years of Leovigild. It is possible that with more specimens of known weight in groups C 2, C 4 and C 5, the weight standard maintained there might also drop to the level of C 3 and IR. The good weight of C 1 (1.413), however, is based on a large number of specimens as second largest of the "curru" issues so that it is possible that these other issues may reflect the character of this group rather than the lower standards of C 3 and IR.

The low weight standard in some of these issues that must date from the late 560's to ca. 578, presents another facet when Cabré's analysis of the quality of the gold in the Zorita Hoard is related to the coins in question. Groups JII 2 and JII 3 are known almost exclusively through the existence of the Zorita Hoard, and their average weights vary decidedly: 1.096 or 1.130 to 1.4822 or 1.4823.<sup>23</sup> On the basis of weight, JII 3 is an excellent issue, and JII 2 has all the characteristics of irregular currency; however, the contrary is true. Twenty-two of the twenty-four JII 2 coins are of good gold, while only seven of the twenty-eight Zorita JII 3 items are of good gold. The only poor gold coins in Zorita JII 2 weigh 1.44 and 1.47 gms.<sup>24</sup> The good gold specimens of Zorita JII 3 weigh 1.04, 1.49, 1.50, 1.40, 1.51, 1.44, 1.45,<sup>25</sup> while the good gold items of Zorita JII 2 weigh anywhere from 0.86 to 1.48 gms., with only five of the coins weighing above 1.40 gms. It would seem from this that conflicting fiscal measures are adopted at different mints to resolve the financial crisis of this unsettled moment in the Visigothic Kingdom. More important is that all the coins in the Zorita Hoard that bear the name of Leovigild are of good gold whether they fall in JII 3, JII 4, JII 7 or IR groups. This is true for the "curru" issues as well with but one exception, C 4 item no. 595 (Zorita 77). Is the small number of coins upon which this observation is based too small to conclude

<sup>23</sup> See Chart X.

<sup>24</sup> The Zorita JII 2 poor gold items are nos. 428, 431.

<sup>25</sup> The Zorita JII 3 poor gold items are nos. 441-447, 454, 459, 460, 461-463, 466-471, 472 and 476.

that Leovigild's first currency reform does not only amount to the placing of his name on the coin but also in attesting to the restored good quality of its gold and in some degree to the uniformity of its weight?

The same development is found if the weight averages of the combined major and subordinate groups are studied, except that the standard fluctuates between 1.40 to 1.51 gms. In Chart XI as in Chart X, many of the groups consist of coins whose weights range from 1.00 to 1.50 gms., e.g., JAN 5, JII 2, JII 3 and JII 5. The individual variability of coins within a group increases as they proceed from the Anastasius to the Justin II issues. It is not until the issues of Justin II, nevertheless, that there is a uniform distribution such as in JII 2, JII 4 or JII 5. While groups such as JAN 5 have coins at the bottom of the weight chart, the bulk of the specimens are found in one range, 1.41–1.45 gms. This is to some extent true in JII 3 (1.45–1.50 gms.). Such patterns are determined by the number of coins which have been assigned to a group, and a larger number of coins assigned to any of the Justin II groups might also show a concentration in one weight bracket as is seen in the earlier groups. Nevertheless, a general working assumption may be suggested for predicting the weights of specimens in any of the large groups; that the weights of such coins would most probably fall into the same area as that of the majority group. A case in point is the collection of the Gabinete Numismático de Cataluña which is not included in the statistical compilations for the weight charts, since the charts were tabulated before this collection was studied. Note the concordance on page 151.

Of the twenty items, ten do not fall into the weight range of the largest number of the coins in the group; however, a closer inspection of these ten reveals that more of them than appear to do fit the majority pattern. Those coins that do match exactly are specimens of JI 3, JAN 5, JII 2, JII 4a, JII 7, C 2 and C 3. Of these JI 3, JII 7 and C 2 are small groups, and a full pattern is not evident. JAN 5, JII 2 and JII 4a are large groups, but the coins of the group are evenly distributed throughout the weight chart. Perhaps then it may be concluded that coins which are assigned to these latter large groups tend to even out the distribution in the weight range. To

BARCELONA ITEM	STYLE GROUP	ITEM WEIGHT	WEIGHT BRACKET OF MAJORITY COINS	AV. WGHT. LARGEST WEIGHT GROUP
No. 2	A 3	1.448	1.41-1.45	1.44
8	J1 1	1.42	1.41-1.45	1.43
4	J1 3	1.37	1.45-1.50	1.48
5	JAN 1	1.45	1.41-1.45	1.42
10	JAN 2a	1.42	1.41-1.45	1.429
6	JAN 5	1.389	1.41-1.45	1.43
7	JAN 5	1.436	1.41-1.45	1.43
13	JAN 8	1.437	1.41-1.45	1.43
9	JII 2	1.16	1.06-1.10	1.096
18	JII 2	1.374	1.06-1.10	1.096
19	JII 4a	1.203	1.41-1.45	1.43
11	JII 5	1.463	1.45-1.50	1.485
12	JII 5	1.496	1.45-1.50	1.485
21	JII 7	1.376	1.41-1.45	1.485
17	C 2	1.222	1.41-1.45	1.45
14	C 3	1.334	1.26-1.30	1.2888
15	C 3	1.416	1.26-1.30	1.2888
16	C 3	1.028	1.26-1.30	1.2888
20	IR	1.32	1.31-1.35	1.309
22	IR	1.33	1.31-1.35	1.309

project further, coins of lower weight might have once existed or are still to be assigned to such groups of a wide range of weight distribution such as JAN 5 and JII 2. Another qualifying aspect is that the weights of the JAN 5, JII 2 (Barcelona No. 9), and the JII 7 items are very close to the weights of the majority group. This leaves only one of the JII 2 and some of the "curru" items as being out of order with the average weight of the majority coins in each of the style groups.

If the hypotheses developed from an interpretation of the weight charts are valid, is there any correspondence between the weight patterns of the Leovigild coins struck by specific mints and earlier mintless issues of Leovigild and his predecessors? In both of Leovi-



gild's series with mint identification, the lowest weights and the widest range of weight distribution are to be found at Córdoba (1.03), Seville (1.08), Evora (1.09), and Mérida (1.06).<sup>26</sup> In the pre-Leovigild issues only in JAN 5, JII 2 and JII 3 are such poor weights found combined with a pattern of wide range distribution. Could we then work on the assumption that an Andalucian provenance for these style groups is a probability? Note also that this situation is true again in the time of Reccared for the mint of Mérida. The mint of Narbonne is characterized from Leovigild through Witteric by a narrow range of weight variability as well as a tendency to maintain traditional weight standards.<sup>27</sup> Can we suggest such early groups as A 1, JI 1, JI 2 and JAN 2 as being products of Narbonne? Might this be said also for such groups as C 1 and C 2? Naturally before such a conclusion may be accepted other evidence is necessary.

No substantial information can be gleaned by combining the information of the weight charts with the stylistic progressions as seen in Charts X c through h. Does the uniformity of the weight standard in Charts X d, X h, X i indicate that the progressions in each chart signify the products of a single mint; while the variability in X c and X g indicates that these progressions are formed from the product of different mints? This evidence is not sufficient to accept these conclusions.

What is apparent in a study of the weight charts is that from the time of Anastasius to that of Leovigild the Spanish mints strike a tremissis of a theoretical weight standard of 1.516 gms. This standard is altered only in some of the issues of Justin II and Leovigild, JII 1, JII 2, C 3, C 4 and IR in which the tremissis is struck at a theoretical weight standard of 1.326 gms. as in France.<sup>28</sup> This light tremissis of twenty-one carat gold is not retained but is replaced by Leovigild's heavy tremissis (facing busts) of eighteen carats.

#### MINT ATTRIBUTIONS

When all the evidence, numismatic and otherwise, is analyzed, it is impossible not to conclude that the Visigoths are primarily involved

<sup>26</sup> Miles, pp. 156-157.

<sup>27</sup> Ibid., pp. 156-158.

<sup>28</sup> Grierson, *NC* 1953, p. 77.

in the striking of the VPW tremisses, not only because of the persistent issuance of the coin into the Leovigild period, but also because of the aesthetic formularization of the types. The latter indicates the maturation of a "home grown" product, rather than a cultural borrowing or imitation. A study of the political and cultural aspects of the period encourages the acceptance of the qualifying hypothesis that the initiator and prime mover is Theodoric, regent of the Visigothic Kingdom, and his advisor Cassiodorus. The Merovingian and Burgundian minting of this VPW coin would otherwise remain inexplicable if the Visigoths were solely responsible for reintroducing this coin. The acceptance of this hypothesis must also force acceptance of a date of ca. 510–511 as the possible initial date of the Anastasius VPW issue. This in turn determines attributions, since it makes the assignation of any of the VPW issues to Alaric II and his Kingdom of Toulouse impossible. This is the possible flaw in the hypothesis, however, for if the VPW Anastasius issues are removed from Alaric II's coinage, what is left to be assigned to him? Considering that Alaric II would continue the policy of his predecessor, he would have struck gold solidi as well as a tremissis. This tremissis could be a VGC or a cross-in-wreath, although the former seems a more correct type for the time. There are no Anastasius cross-in-wreath coins known to me. The VGC tremisses should then be studied for possible Visigothic (Alaric II) issues. The numerous accusations that Alaric's gold currency is not trustworthy might encourage the acceptance of the thesis that because this poor gold was melted down and recoinied in a pure state, most of Alaric's gold, if not all of it, is not extant.<sup>20</sup>

The attribution of Anastasius issues, consequently, should include Visigothic issues of Narbonne, possible Burgundian and Merovingian issues, and Ostrogothic issues which provided the prototype. Our evidence further suggests that most, if not all, the Anastasius groups come from southern France, their major provenance area. The classification and attribution of the Anastasius series will differ from Reinhart's, who traced the VPW back into the reign of Alaric II and the mint of his capital, Toulouse. If the VPW was struck by Alaric II as Reinhart and everyone else has determined, the Anasta-

<sup>20</sup> Reinhart, *Tolosanischen*, pp. 117–118.

sus Visigothic issues would have to be divided between Toulouse and Narbonne before and after 507.

Before the various groups can be assigned to mint cities two further observations, suggested first by Reinhart, must be considered. First, that on the basis of earlier fourth and fifth century mint practices, it may be assumed that coins would be issued at least at cities of royal residence, which would provide the location of the major mint for that period, if not the only one. Second, that it would seem plausible that mints which issued Leovigild coins with their mint name on them also issued the earlier Leovigild coins without mint names. Reinhart organized his coins partially on this basis.

In regard to this "capital theory" the possibilities would be as follows:

BYZANTINE EMPEROR	VISIGOTHIC CAPITAL AND KING
Anastasius (491-518)	Toulouse (to 507) (Alaric II) Narbonne (511-518) (Amalaric)
Justin I (518-527)	Narbonne (Amalaric)
Justinian (527-565)	Narbonne (527-531) (Amalaric) Barcelona (531-540's) (Theudis, who dies in Seville 548) Seville (540's-549) (Theudis and Theudigils, who dies here in 549) Mérida (ca. 550-554) (Agila, who dies here in 554) Toledo (ca. 554-565) (Athanagild)
Justin II (565-578)	Toledo (565-567) (Athanagild) Narbonne (567-572/3) (Liuva) Toledo (573- ) (Leovigild)

This list must then be enlarged by an analysis of the Leovigild mints.<sup>30</sup> These number fifteen in all, although only four issue a large

<sup>30</sup> This information has been taken from Miles, pp. 182-198.

number of coins if we accept the thesis that the extant coins are directly proportionate to the original mint product: Toledo (44), Mérida (22), Evora (21), and Seville (11). These mints are also responsible for the largest number of coins issued in the reign of Reccared: Toledo (69), Mérida (102), Evora (35), and Seville (42).<sup>31</sup> Other important mints for both reigns are Saragossa (7,23) and Córdoba (6,20). Both Barcelona and Tarragona are poorly represented for Leovigild (2 and 1 respectively) but have larger extant Recared pieces (26,28). In the last period of the anonymous coinage, therefore, Toledo, Mérida, Evora and Seville most likely issued coins. These might be the major mints while Barcelona, Tarragona, Saragossa and Córdoba would be of secondary importance. Córdoba might be more important than extant Leovigild coins suggest since the Hermenegild revolt interfered with mint production in the 580's and with the adoption of Leovigild mint name coins. The exultant boasting in Leovigild's commemorative CORDOBA BIS OPTINUIT series of 584, might indicate the importance of this center which had been under Byzantine rule from 567 to 572.

The city of Narbonne for the Leovigild and Recared period is much less important, sharing seventh place with Rodas (5,9). Since it was the capital of Liuva from 567-573, a larger number of anonymous coins might be associated with it. Narbonne should also share in the anonymous issues. The final list of possible mint locations could be Toledo, Mérida, Evora, Seville, Narbonne, Córdoba, Barcelona, Tarragona and Saragossa.

The capital hypothesis presents another problem. Did the mint move with the capital and thereby establish the mint workers as part of the royal entourage, or once a mint was established did it continue to exist even after the city lost its royal status? Since the numismatic evidence suggests different forms of progression, the latter assumption would seem preferable. There are too many styles existing contemporaneously to allow the attribution to one mint. Reinhart's suggestion of provenance determining the mint location, with all the attendant difficulties of such a method, would also dispel the idea of a single monetary source for Visigothic coinage at any given period.

<sup>31</sup> Miles, pp. 201-234.

What is revealed when the capital theory is related to the stylistic groupings and to the scant provenance information is a pattern of large, extant stylistic groups with both contemporaneous dependent and completely independent groups. The large groups might logically be assumed to be those of the main mint which at that time would be a capital city, and minor groups might be located in former capitals or other important cities. The measures taken by Theodoric as noted in Cassiodorus' letters to control and prohibit non-official minters would seem to indicate the possibility of many local mints.<sup>32</sup> This suggestion would be in accordance with traditional mint practices of the late empire in the fourth and fifth centuries.<sup>33</sup>

Reinhart attributed the Visigothic VPW coinage and dated it as follows:<sup>34</sup>

Anastasius		Alaric II Amalaric	Toulouse to 507 Narbonne to 518
Justin I		Amalaric	Narbonne to 527
Justinian	A	Amalaric	Narbonne to 531
	A	Theudis	Barcelona to 548
	B	Theudigils	Seville to 549
	C	Agila	Mérida to 554
	D	Athanagild	Toledo to 565
Justin II	D	Athanagild	Toledo to 567
	D	Leovigild	Toledo

He expanded this capital theory to permit the issuance of coins on a continuum basis at former capitals, that is, the Narbonne-

<sup>32</sup> Cassiodorus, Bk. V, letter 39; Bk. VII, Formula 32.

<sup>33</sup> Kent, p. 198. Also see *RIC IX*, pp. XXVI-XXXVIII; Keary, pp. 49-72; Le Gentilhomme, *RN 1943*, pp. 45-82.

<sup>34</sup> Reinhart's major articles on Visigothic material are: "Die Münzen des Tolosanischen Reiches der Westgoten," in *D.J.N.* (1938), pp. 107-135; "Die Münzen des westgotischen Reiches von Toledo," in *D.J.N.* (1940-41), pp. 69-101; "Nuevas aportaciones a la numismática visigoda," in *Archivo Español de Arqueología*, XVIII (1945), pp. 212-235.

Barcelona Justinian coins are issued through Agila; the Justinian Seville group by Agila, Athanagild, Liuva, and Leovigild; the Méridan issues by Agila, through Leovigild; and the Toledo group by Agila, Athanagild and Leovigild. He further expanded his Seville group to include a suggestion of possible Córdoba attribution for these and a continuation under Byzantine rule. He classified his coins, therefore, according to the capital pattern with one exception; the possible coins of Liuva from Narbonne. Reinhart attributed no Justin II group to Narbonne and Barcelona. For him the mints moved south, along with the spreading Visigothic population. This is the major weakness with Reinhart's groupings. Reinhart further substantiated his attributions by assuming that local collections were built predominantly upon locally found specimens. Coins of Group A, therefore, which are found mostly in southeastern France and north-eastern Spain are of Narbonne and Barcelona; coins of Group B found mostly in Spain and in Andalucía are of Seville and Córdoba; those of Group C from western Spain and Portugal are from Mérida; and those of Group D found primarily in Spain and so closely associated with the only VPW coin bearing a mint mark of Toledo and with the money of Leovigild, non-extant but described by Florez, must be Toledo.

My conclusions will indicate that I do not deviate greatly from the attributions brilliantly conceived by Reinhart. It is regretted that he did not publish his statistical findings or a complete catalog of coins studied. Such an endeavor was naturally beyond the scope of an article. It must be realized, however, that Reinhart's attributions were presented only as considered suggestions, and the changes in the make-up of his groups from his early and late articles reflect his own questioning and reorganizing attitudes. The chart on page 158 compares the composition of Reinhart groups with my stylistic groups.

The major difficulties in comparing both groups are due to the more general amorphous quality of Reinhart's. The groups are not distinct or specific enough. His classifications overlap many of mine. The less specific nature of his groups is responsible for the major disagreement between Reinhart's Merovingian attributions and those presented here. He would assign all of Group A 3, most of JI 1, and JAN 3 to

Kgd. of Toulouse until 507	A 1, A 2, A 2a, A 2c, A 1c, A 1j, A 4
Narbonne continuing Toulouse Types 511-527	JI 2, JI 3
Group A (Narbonne-Barcelona)	JI 1, JAN 1, JAN 2, JAN 7, JAN 8
Group B (Seville-Córdoba)	JAN 3, JAN 5, JII 5, JII 1, JII 2, JII 3
Group C (Mérida)	JII 4, JAN 4
Group D (Toledo)	JAN 4, C 1, C 2, C 3, IR

the Merovingians. All of these I classify as Visigothic.<sup>35</sup> Coins of JI 1 and JAN 3 groups are also placed by him in Visigothic Groups A and B respectively.<sup>36</sup> If the coins illustrating his Merovingian article are compared with my lists, only sixteen coins of the forty-two depicted agree with my non-Visigothic attribution, but of these I consider half as possibly Burgundian rather than Merovingian.<sup>37</sup> In that same article, nevertheless, I would agree with his Burgundian-Merovingian attribution of the seven coins illustrated in Abb. 1, and his southern Gaul Merovingian copies of Visigothic issues in Abb. 3.<sup>38</sup>

In order to attribute the style groups to particular mints I have been governed particularly by the stylistic progression analysis as seen in Chart VIII, which has encouraged the separation of the groups into Visigothic, Merovingian, Burgundian and Ostrogothic. These groups have been separated further as to major and minor by both quantitative and qualitative considerations. A major group would be defined as one which consists of large extant quantities and is important for stylistic influence. To the arrangement of these the hypothesis of the capitals as mints and the mints of Leovigild's

<sup>35</sup> Reinhart, *Merowinger*, pl. III, 1-42.

<sup>36</sup> Note Chart on pp. 168-169.

<sup>37</sup> Reinhart, *Merowinger*, pl. III, 6, 9, 10, 13, 14, 17, 18, 22, 27, 28, 29, 36, 40, 41, 42.

<sup>38</sup> Ibid., Abb. 1, p. 41; Abb. 3, p. 44.

national coinage have been applied. Substantiation for some of the attributions has been found by relating anonymous pre-Leovigild and Leovigild groups to Visigothic national coins of known mints; and to Merovingian, Burgundian, Ostrogothic, and Italian Byzantine coins.

A study of stylistic Chart VIII has resulted in some general attribution determinants. The progression beginning with A 1 and ending in the INCLITUS REX group is the major purely Visigothic channel. It traces uninterruptedly the development of the six-legged insect Victory type and the Leovigild portrait bust. The second major progression A 4 becomes diffused after JAN 3 but strongly influences groups such as JAN 4 and JAN 5 which are also influenced by JAN 2. Because of the closer ties of the A 1 progression with national coinage of Toledo and the mints of the Tarraconensis, this progression is attributed wholly to the Narbonne-Barcelona-Toledo area. The intricate interrelationships of JAN 4, JAN 5 and JAN 3 and all of their descendent Justin II groups, and their relationships to the coinage of the national mints of Seville, Mérida, Evora, Córdoba and Italica encourage an attribution for this progression (at least from JAN 3 on) to southern Spain. These Andalusian groups have been assigned also because of their strong connections with Ostrogoth, Italian Byzantine and Hispano-Byzantine coins.

#### ANASTASIUS

A 1 Visigothic. Narbonne. The close stylistic connections with late fifth century Milanese and Gallic issues may continue directly the style of Alaric II's Toulouse issues of poor gold. This would also help to explain the large number of coins bearing letters in the reverse and obverse fields as Frankish copies of Visigothic coins from Frankish or former Visigothic mints in former Visigothic territory still traditionally following the coins of the major mint in the area.<sup>39</sup>

A 1a A variant which may or may not be Visigothic.

A 1b-A 1h All these are variants with letters in the field that stylistically suggest a Merovingian attribution, particularly groups A 1c, A 1d, A 1e, A 1f.

\* Le Gentilhomme ascribed no. 28 (PLATE II) as from Toulouse and no. 35 (PLATE II) as from Narbonne. See Le Gentilhomme, *RN 1943*, pl. 4, nos. 19, 20.



*A 1i* A variant which may or may not be Visigothic. The Victory figure is close to *A 2c* and might better be placed in the orbit of *A 2*.

*A 1j* Visigothic. Perhaps a late issue of the mint of Narbonne and a link between the coins of *A 1* and *A 3*.

*A 2* The many connections with Burgundian and Ostrogothic types might suggest a non-Visigothic attribution and possibly coins from the Ostrogothic Gallic provinces, from mints such as Arles or Marseilles. However, it might represent early copies of dies sent from Rome or Ravenna by Theodoric and minted at Narbonne, while the *A 1* group of more local origin was also being minted.

*A 2a* This is an extension of *A 2* and is of the same mint.

*A 2b* This contains a number of variants that might represent Merovingian imitations. At any rate they are not products of this mint of *A 2*, but may be imitations of it.

*A 2c* This sub-group presents another mint within the orbit of *A 2*, but must descend from a mint in the Merovingian area once under Visigothic control.

*A 3* Visigothic. Narbonne. Possibly a late issue just before 518 and the death of Anastasius.

*A 3a* A variant which may or may not be in the Visigothic area. Stylistically it is not too unlike variants of *A 4*.

*A 3b* Non-Visigothic variation of *A 3*. These coins may be Merovingian if the letter *S* in the field refers to a city, or Burgundian if the letter refers to Sigismund.

*A 3d* Burgundian. In addition to the stylistic justification is the possible interpretation of the field letters as standing for Lyons.

*A 3e* Burgundian. A variant of *A 3d*.

*A 4* This is much closer to the Visigothic orbit than *A 2*, but like *A 2* it has strong stylistic connections with Ostrogothic types. Since it is a parent of groups which are committed to Leovigild issues, however, its Visigothic attribution would seem necessary. It may be connected also with Arles or Marseilles and therefore not be a Visigothic Anastasius issue. Note particularly the absence of a pectoral cross even in its immediate descendent *JI 2*. It is not until *JAN 3* that this progression becomes stylistically Visigothic.


*A 4a–A 4b* Variants which connect A 4 to A 2 in the treatment of the portrait chest in A 4a and in the entire portrait of A 4b. These encourage an Ostrogothic-Gallic attribution to Provence. Arles? Marseilles?

*A 5* Burgundian. Lyons. These date during the reign of Gundibald ending with his death in 516. Both the Victory figures and the portrait busts connect these coins to the later Byzantine issues.<sup>40</sup>

*A 5a* Burgundian. Lyons. Extends the mint product of A 5 into the reign of Sigismund and dates from 516 to 518, the death of Anastasius.

*A 5b* Burgundian variant whose field letters may stand for Lyons.

*A 6* Burgundian. Lyons. In both obverse and reverse types it follows the Burgundian motifs of A 5. Coins of this group have been given to the Vandals by Wroth.<sup>41</sup>

*A 6a–A 6b–A 6c* Burgundian. All of these bear letters in the reverse field which may represent the beginning stages of the  monogram, or variations of the same as seen in the later JI 5.

*A 7* Ostrogothic. Rome. I would agree with the judgment of Wroth and would associate these with the Italian Ostrogothic mints. These are the possible prototypes for the Visigothic issues.

#### JUSTIN I

*Jl 1* Visigothic. Narbonne. This is the major style of the capital, dating from 518.<sup>42</sup>

*Jl 1a* Merovingian. A peculiar treatment of the hair and of the legends as well as a disproportionate relationship between head and chest encourages a non-Visigothic attribution for this Alesia piece.

<sup>40</sup> Le Gentilhomme also attributed this to the Burgundians. See Le Gentilhomme, *RN 1943*, pl. 4, no. 24.

<sup>41</sup> Le Gentilhomme also attributed this to the Burgundians from the mint of Lyons. See Le Gentilhomme, *RN 1943*, pl. 4, no. 8.

<sup>42</sup> Le Gentilhomme saw all coins with the sequence of T as the last part of the obverse legend to be from Toulouse. See Le Gentilhomme, *RN 1943*, pl. 4, no. 28.

- JI 1b* Merovingian. A unique variation of the major group.  
*JI 1c* Visigothic. Narbonne. A later issue of the *JI 1* type, which prepares the way for the long-chested forms of *JI 3*.  
*JI 1d* Visigothic. Narbonne. A possibly last stage of *JI 1* and a link with *JAN 1*, consequently dating towards 527.  
*JI 1e-JI 1f-JI 1h* Possibly Visigothic variants of *JI 1*.  
*JI 1g* A possibly Merovingian variant by nature of the crudeness of execution.  
*JI 2* The similar problem of *A 4* again is seen here with the possible attribution to Narbonne or to Arles.<sup>43</sup>  
*JI 2a-JI 2b* Possibly Merovingian variations.  
*JI 3* Visigothic. Narbonne. This is a later variation of *JI 1* and dates toward 527.  
*JI 3a-JI 3b* Variants which may or may not be Visigothic.  
*JI 4* This may come from a Burgundian mint or from Arles. It is very close to Burgundian-attributed *A 3d*.  
*JI 5* Burgundian. These follow in the tradition of *A 5*, especially the coins of *A 5b*.<sup>44</sup>

## JUSTINIAN I

- JAN 1* Visigothic. Narbonne. This must date between 527 and 531.  
*JAN 1a* This variant may or may not be Visigothic.  
*JAN 2* Visigothic. Barcelona. (ca. 531-ca. 540).<sup>45</sup>  
*JAN 2a* This is a later development of *JAN 2* styles and is the link between it and *JAN 8*. It may very well postdate 540, and be an example of a mint product from Barcelona after it has become the capital.  
*JAN 2b* This is composed of a number of variables which may or may not be Visigothic and may be best classified as unofficial.<sup>46</sup>  
*JAN 2c-JAN 2d* These may be Merovingian variations.

<sup>43</sup> Ibid., no. 23.

<sup>44</sup> Le Gentilhomme attributed this to the Burgundians. See Le Gentilhomme, *RN 1943*, pl. 4, nos. 5, 9, 10, 14, 15.

<sup>45</sup> Le Gentilhomme accepted this as Reinhart Group A. See Le Gentilhomme, *RN 1943*, pl. 4, no. 29. A coin of this group was found in a Santander Hoard in 1910, see Jusué, p. 483.

<sup>46</sup> Le Gentilhomme attributed this to the Franks. See Le Gentilhomme, *RN 1943*, pl. 4, no. 25.

*JAN 3* Visigothic. Andalucían(?). These may be the early issues from the province of Baetica, dating from 527. Since the group descends directly from A 4–JI 2, this may suggest that the Andalucíans are following coins of Arles and of Ostrogothic Rome. The Hispano-Roman population of Baetica had stronger connections with Italy and Provence than it would have had with the Visigoths at Narbonne and Barcelona. The Andalucían assignment of this group would be in agreement with the Andalucían nature of all later groups directly or indirectly associated with it.<sup>47</sup> The direct connections between this and JI 2, however, may still assign this group into the same category as Narbonne (?) or Arles (?).

*JAN 3a* This represents a free but Visigothic and Andalucían variation. It perhaps even further attests to the persistence of Roman values in southern Spain.

*JAN 3b* This may represent an early attempt of Andalucían rendering of Ostrogothic coins, such as in A 7.

*JAN 4* Visigothic. Mérida. This dates from and possibly after 549 to 554. The approach here is very similar to the traditions followed on the national coinage (cf. PLATE B).<sup>48</sup>

*JAN 4a* A later version of the Mérida mint indicating the gradual adoption of “curru” types.

*JAN 4b* If a legitimate coin, it is an extraordinary one and must come from this mint. Its reverse Victory and legend are in the tradition, but its obverse portrait is that of the Leovigild national coins. It must date ca. 575.

*JAN 5* Visigothic. Seville. This group dates from the late 540's, when Seville was the residence of Theudis and Theudigils and may continue into the next decade or so.

*JAN 6* Visigothic. A mint in the Tarraconensis. It is a richer variation of the style of JAN 2. It may also be a variation from the same mint of Barcelona.

*JAN 7* Visigothic. A mint in the Tarraconensis. Like JAN 6, also a variation of JAN 2, and possibly also from Barcelona.

<sup>47</sup> Le Gentilhomme assigned this to the Franks from a mint in southern Gaul. See Le Gentilhomme, *RN 1943*, pl. 4, no. 32.

<sup>48</sup> Le Gentilhomme accepted this as Visigothic and of Reinhart Group C. See Le Gentilhomme, *RN 1943*, pl. 4, no. 30.

*JAN 8* Visigothic. Toledo. These must be the coins of Athanagild and may be dated from 554 to 565. They are the Justinian forerunners of the "curru" types, as well as of the INCLITUS REX group.

*JAN 8a-JAN 8b* These are variations which may or may not be Visigothic. They may mark some of the early Suevian copies of Visigothic issues. If they are Visigothic, they are the product of some mint within the Carthaginensis.<sup>49</sup>

*JAN 9* Non-Visigothic. The relationship here to the Victory found on A 2c and to the heads roughly of the A 1-A 3-JI 1 progression and the provenance of two of these three coins from the Alesia Hoard suggest a Merovingian attribution.<sup>50</sup>

*JAN 10* Non-Visigothic. The obverse type certainly follows the JI 3 progression but with more freedom and would seem to depend upon it except for the unusual Victory form. This may also suggest a Merovingian product.

*JAN 11* Burgundian. This follows in the tradition of JI 5 and since it contains coins of Theodebert I, there is an indication of the shifting of this Burgundian mint into the control of the Merovingians.<sup>51</sup>

*JAN 11a-JAN 11b-JAN 11c* All are of Burgundian-Merovingian mints.

#### JUSTIN II

*JII 1* Visigothic. Evora (?). A variety here within the Andalucían area diverse from other groups and possibly limited to this mint.

*JII 2* Visigothic. Seville. These proceed from JAN 5, and form a large part of the Zorita Hoard.

*JII 2a-JII 2b* These consist of crudely formed variants that may or may not be Visigothic or of an official mint.

*JII 3* Córdoba. These are issued after 572, under Leovigild. The revived Italian mint connections, the connection between the style and technique of the die makers which is not different from Córdoban

<sup>49</sup> Le Gentilhomme attributed no. 390 (PLATE XIX) to a Frankish mint of southern Aquitaine. See Le Gentilhomme, *RN 1943*, pl. 4, no. 31.

<sup>50</sup> Le Gentilhomme attributed no. 391 (PLATE XIX) to the Franks. See Le Gentilhomme, *RN 1943*, pl. 4, no. 26.

<sup>51</sup> Le Gentilhomme attributed these to the Burgundians. See Le Gentilhomme, *RN 1943*, pl. 4, nos. 11, 12, 13, 16, 17, 18. He further saw one of this group as being Merovingian from Reims. See his pl. 4, no. 34.

national coins, and the connections with coins of Seville, Italica and Mérida, suggest Córdoba.

*JII 3a* A variant but most likely of the same mint.

*JII 4* Visigothic. Mérida. This dates after 565. These are issued particularly after 568, and Leovigild's kingship down to 579, and Hermenegild's revolt. Coins with Leovigild's name must date before the revolt of Hermenegild. The legends compare very well with the stereotyped manner of later coins from Mérida and Evora. Once the garbled legends stop the rendition of DNLIVVIGILDVS REX is quite accurate.

*JII 4a–JII 4b* These may be coins of Suevian imitation or unofficial mint products. The crudeness seems to remove them from the responsibility of an official Visigothic mint.

*JII 5* Visigothic. Narbonne. This is the coin issued by Liuva from his accession in 565, and it extends to the 580's, until it is replaced by the cross-on-steps reverse type of Leovigild.<sup>52</sup>

*JII 5a* A version of a "curru" coin that may suggest a dating of after 573, when Leovigild assumes sole control, and the capital moves back to Toledo.

*JII 5b* Here are placed cruder variations of this group and might not be officially connected with this mint.

*JII 5c* This coin is the only one of the group with the name of Leovigild and is the last coin before the introduction of the cross-on-steps reverse.

*JII 6* Visigothic. Seville or Italica. Its connections with JAN 5 and JII 2 place the mint for this in Andalucía.

*JII 7* Visigothic. Evora (?). Since this does depend on JII 1, it may be a product of the same mint. The association of these coins with the design developments of the H 1 issue, if authentic, may also place this in the region of Andalucía.

#### CURRU-INCLITUS REX-HERMENEGILD GROUPS

*C 1–C 2* Visigothic. Toledo. The first possible coins of Leovigild from the late 560's to 573, when his sole rule begins.

<sup>52</sup> Coins from this group have been found in a Santander Hoard. See Jusué, p. 483.

*C 3* Visigothic. Toledo. May follow on the heels of *C 2* and may date from around 573, since it is the form propagated after 573 in other mints.

*C 4* Visigothic. This may be a variable from a mint in the Carthaginensis after 573, and Leovigild's possible measures for monetary uniformity.

*C 5* Visigothic. Mérida. Naturally develops from other Emeritan groups and connects with later national issues. Must date ca. 577/578.

*IR* Visigothic. Toledo. These may be issued by Leovigild from 579 to the early part of 580, just before and during the opening stages of the Hermenegild revolt. This coin is officially replaced by the cross-on-steps type at the end of 580 or in 581. Once the revolt is put down, Leovigild's mint establishes the new national coin with the facing busts which becomes uniform and standard throughout the kingdom (584).

*H 1* If this is not a forgery, which it most probably is, it would have to be the first issue of Hermenegild and consequently from his capital at Seville (ca. late in 579, or 580).

*H 2* Visigothic. Seville. These are the *INCLITUS REX* issues of Hermenegild and most likely come from his capital. Grierson in his unpublished manuscript tentatively has given these to Córdoba, since he considers these the later of the two accepted Hermenegild issues (580–583).

*H 3* Visigothic. Seville. This is the *REGI A DEO VITA* issue of Hermenegild and may come from Córdoba as well. Grierson has placed this, struck at Seville, as the first and earlier issue of Hermenegild (580–583).

*H 4* Another *REGI A DEO VITA* issue which, if it does not come from a mint other than *H 3*, is a false group of two coins (580–583).

These attributions should be compared with those suggested by Miles in his study of the national coinage. As may have been noted already from a study of Chart VIII, the eight groups separated by Miles are equal to six groups in this study. The coins he has placed in his Type G have been separated into two groups, *JII 3a* and *JII 4*. At the same time several of his Types have been consolidated into one group, e.g., Types A and D are part of *JII 5*, and Types B, F,

and part of G are grouped into JII 4. The following chart will clarify the comparison.

MILES TYPE A (Andalucía ?)	Narbonne .... JII 5
B (Mérida ?)	Mérida ..... JII 4
C (?)	Evora ..... JII 7
D (Andalucía ?)	Narbonne .... JII 5
E (?)	Narbonne .... JII 5c (Tarraconensis)
F (Mérida)	Mérida ..... JII 4
G (?) (Miles, pl. I, 5, 6) (Miles, pl. I, 7)	Mérida ..... JII 4 Córdoba ..... JII 3a
H (Toledo)	Toledo ..... IR

When these attributions are compared with those of Reinhart's, many points of agreement are found. The main difference is that the groups organized here are more numerous than those established by Reinhart. A late group for Narbonne has also been culled from his Andalucían group.

REINHART GROUP	
A (Narbonne-Barcelona)	Groups given to: Narbonne, Barcelona, Tarraconensis(?), and Toledo
B (Seville-Córdoba)	Groups given to: Andalucía (?), Seville, Evora (?), Córdoba, Narbonne.
C (Mérida)	Mérida.
D (Toledo)	Mérida, Toledo.



The comparison of Reinhart's, Miles' and my attributions appears in Chart VIIIa. The general agreement that is evident in the attribution of local styles, e.g., Toledan, Narbonensis and Tarraconensis and Andalucian is only true in the larger sense. If the coins are taken individually, a divergence of opinion is evident. On stylistic grounds, both Reinhart and Miles grouped coins together that I would not consider similar. This is most apparent in the assigning of the Merovingian items.

## CHART VIIIa

GROUP	REINHART	MILES	TOMASINI
A 1	Toulouse		Narbonne (Toulouse if before 507)
A 1c	Toulouse		Merovingian (?)
A 1j	Toulouse-Merovin- gian		Narbonne (Toulouse if before 507)
A 2	Toulouse		Narbonne (?), Arles (?)
A 2a	Toulouse		Narbonne (?), Arles (?)
A 2c	Toulouse		Merovingian (?)
A 3	Merovingian		Narbonne (later)
A 3d	Merovingian		Burgundian
A 3e	Merovingian		Burgundian
A 4	Toulouse		Narbonne (?)
A 5	Merovingian		Burgundian (Lyons)
A 6			Burgundian (Lyons)
A 7			Ostrogothic (Rome)
<hr/>			
JI 1	Merovingian A – Narbonne-Barce- lona		Narbonne
JI 2	Narbonne 511-527		Narbonne (?), Arles (?)
JI 3	Narbonne 511-527		Narbonne (late ca. 525-527)

GROUP	REINHART	MILES	TOMASINI
JI 4	Merovingian		Burgundian (?), Arles (?)
JI 5			Burgundian
JAN 1	A – Narbonne-Barcelona		Narbonne
JAN 2	A – Narbonne-Barcelona		Barcelona
JAN 3	Merovingian B – Seville-Córdoba		Andalucía (?), Narbonne (?)
JAN 4	C – Mérida D – Toledo		Mérida
JAN 5	B – Seville-Córdoba		Seville
JAN 6			Tarraconensis
JAN 7	A – Narbonne-Barcelona		Tarraconensis
JAN 8	A – Narbonne-Barcelona		Carthaginensis (?), Unofficial (?)
JAN 9	Merovingian		Merovingian
JAN 10			Merovingian
JAN 11			Merovingian
JAN 11b	Merovingian		Burgundian-Merovingian
JII 1	B – Seville-Córdoba		Evora
JII 2	B – Seville-Córdoba		Seville
JII 3	B – Seville-Córdoba		Córdoba
JII 3a		G – (?)	Córdoba
JII 4	C – Mérida	B – Mérida(?) F – Mérida G – (?)	Mérida
JII 5	B – Seville-Córdoba	A – Andalucía (?) D – Andalucía (?)	Narbonne

GROUP	REINHART	MILES	TOMASINI
JII 5c		E - (?)	Narbonne-Tarracon- ensis
JII 6			Seville-Italica
JII 7		C - (?)	Evora
C 1	D - Toledo		Toledo
C 2	D - Toledo		Toledo
C 3	D - Toledo		Toledo
C 4			Carthaginensis (?)
C 5			Mérida (?)
IR	Toledo	H - Toledo	Toledo and others

Besides the disagreement in the Merovingian attributions, differences are found in the Anastasius groups which result from the disallowance of the striking of the VPW before 507. If this is wrong and Alaric II did mint a VPW, the style groups would not change and only the attribution of one group would be affected; Group A 1 would be assigned to Toulouse instead of Narbonne. A 2, dependent as it is on Italian and Ostrogothic issues, would still date after 507. Group A 3 would be dated earlier, being the first issue from Narbonne in 510 or 511.

A further major distinction is in the attribution of the "curru" and INCLITUS REX issues. I would not assign them all to Toledo. Although I have not subdivided the IR issues, I believe that they have been struck by more than one mint and as such represent the first successful move towards a unified national coinage. This is finally achieved in the cross-on-steps issue.

Chart VIIIa reveals the shift of Visigothic activity from northern to southern Spain. This is accounted for by the greater political necessity for the presence of the Court in Baetica and the Carthaginensis because of the increased military involvement there. Note that it is only in the 540's that VPW tremisses are assigned to mints in southern Spain. None of the Anastasius or Justin I groups are assigned to the southern provinces. This is understandable if the view that the southern provinces are still relatively independent is accept-

ed. Unfortunately there are no hoards for this period to illustrate what gold was in use in this region before 540. Collections in the South are devoid of early Visigothic specimens. If this were not the case, the Style Chart VIII would encourage the attribution of groups A 2, A 4, and JI 2 to Andalucía, since later groups stylistically dependent upon these are all assigned to the southern provinces. Both A 2 and A 4 groups are not represented in Spanish collections, however, and are strongly represented in the Cabinet des Médailles and in the Alesia and Gourdon Hoards (See Chart VII). Group JI 2 is represented in Spanish collections, but is better represented in the Cabinet des Médailles, as well as in the Alesia and Gourdon Hoards (See Chart VII). The same situation exists for JAN 3 which has been assigned questioningly to Andalucía, and which must have been produced by the same mint as JI 2 or by another mint which exactly imitated the design.

The Zorita Hoard may help in a study of the coinage of the southern provinces. Chart VII designates the Zorita representation in the following style groups: JAN 2, JAN 5, JII 2, JII 3, JII 4, JII 5, JII 6, JII 7, C 3, C 4, C 5, and IR. Placing these groups in accordance with the numbers of Zorita items represented, largest first, the following order is observed: JII 3 (16-12 ?), JII 2 (18-6 ?) JAN 2 (6-1 ?), JII 6 (5), JAN 5 (4), JII 4 (1-2 ?), C 3 (3), IR (3), JII 7 (2), JII 5 (2 ?), C 4 (1) and C 5 (1). These have been assigned respectively to Córdoba, Seville, Barcelona, Seville-Italica, Seville, Mérida, Toledo, Evora, Narbonne, Carthaginensis (?) and Mérida (?). Of the seven other coins which Cabré considered non-Visigothic, one is a Suevian (PLATE D, 4), two which he called Merovingian have a seated figure on the reverse (PLATE D, 5-6), three are VGC types, which were called Merovingian by Cabré but which I would consider Hispano-Byzantine and unofficial Visigothic imitations of Hispano-Byzantine issues (PLATE D, 7-9), and a final VPW which may be a Merovingian variation of JAN 3. Of the ninety coins in the hoard, sixty-four are from Andalucian mints, six from Lusitania, seven from Carthaginensis, nine from Narbonne-Tarraconensis, one Suevian, and three Merovingian (?). If my attributions are correct, the hoard attests to the dominant rôle of the rich agricultural and commercial Baetica in the coinages of the time of Justin II.

Should groups JII 2 and JII 3 because of their predominance in the Zorita Hoard be assigned to a local or Carthaginensis mint? Stylistic evidence does not warrant this. A large number of the Zorita items are classified in the subordinate groups and could be explained as unofficial imitations of the Seville and Córdoba mint types.

More definite conclusions in problems of attribution must await the future discovery of hoards like Zorita de los Canes.

## VISIGOTHIC ART AND NUMISMATICS

A comparison of the numismatic material with the artistic monuments of the sixth century does not provide the most rewarding results. The paucity and the fragmentary nature of the definite sixth century artifacts limit their use as elements for comparison, as well as does the possibility that such a comparison is fallacious in any event. If these limitations are kept in mind, however, certain general and perhaps specific valid characteristics may be noted. Such qualified parallel associations have been influential as substantiation for the attribution of some of the pre-national groups.

Essential to the entire problem of attribution and the artistic character of the sixth century is an understanding of the precise rôle of the Visigoths.<sup>1</sup> The artistic evidence does not permit any rôle of importance for the Germanic invaders. The numismatic material also attests to this, for it is only as products of Hispano-Roman designers that the coins may be understood. Zeiss' studies of grave sites indicates not only the area of major Visigothic settlements in the first half of the sixth century but also the total absorption of the invaders into the culture of the Iberian peninsula. Even though the disappearance of distinguishable Visigothic graves at the end of the sixth century may be nothing more than an indication of the conversion of the Arian Visigoths, the failure to find any of their characteristic fibulae and other artifacts in any archeological diggings datable to a later period should bear out Zeiss' conclusions.<sup>2</sup> The Visigothic rôle must be seen as one which supports or discourages cultural tendencies

<sup>1</sup> Schlunk, pp. 179-181, n. 4. Also see the general discussions in Schlunk, *Visigodo*; and Palol de Salellas. I would agree with Schlunk's statement (bottom p. 180) "...monumentos o esculturas visigodas que acusen realmente una neta influencia germánica, y esto confirma plenamente el estudio de la escultura 'visigoda' del sur de Francia, de índole netamente distinta de la Península, con la cual los monumentos españoles apenas acusan relaciones. (Véase J. B. Ward Perkins: "The sculpture of Visigothic France," *Archaeologia*, vol. 87, 1937, 79-128.)."

<sup>2</sup> Zeiss, *Grabfunde*, pp. 80, 126, 138 et passim.

already at work in the peninsula. It is the iconoclastic, ascetic, and puritanical nature of the Arian Visigoths that fortifies these tendencies which are already significant for Hispano-Roman culture, a culture that has produced a Seneca, a Trajan and a Theodosius. For both the art and the coinage of this century, Schlunk's statement holds true: "*Este arte no tiene nada de germánico, sino que es de puro abolengo hispanorromano, aunque con numerosos elementos norteafricanos y bizantinos.*"<sup>3</sup>

The dominant foreign influence in Iberian culture of the sixth century is the Byzantine, from Byzantium, North Africa (Mauretania I), southern Italy and Sicily, and the Byzantine Spanish province of Mauretania II.<sup>4</sup> The stamp of this new Rome has finally a character of its own and, accompanying the prestige of the successful restoration of most of the empire, is the rise in its cultural prestige. In Spain the acceptance of Byzantine taste and ideas is seen in art, religion and numismatics. It has been stated previously that Justinian issues from Carthage were very close to contemporary Visigothic coins. This is fully in accordance with traditional cultural, geographic and economic ties between North Africa and Spain. The mosaic sepulchral tombstones, the use of decorated brick tiles of baked clay,<sup>5</sup> the ceramic ware, the plans of churches as the Basilica de Algezares (near Murcia, 550–600), and the sixth century double apse churches such as San Pedro de Alcantara (Málaga), Alcaracejos (Córdoba) and the Casa Herrera (near Mérida) are physical evidence of this cultural intercourse.<sup>6</sup> When Spanish and African religious and intellectual associations are studied, it is not difficult to understand the success of the Arab conquest or the rich civilization it developed. There is no place in Europe that the Arab could have settled and intermingled so well. Andalucía is more North African

<sup>3</sup> Schlunk, *Visigodo*, p. 228.

<sup>4</sup> Ibid., pp. 247–248. Also Schlunk, pp. 203–204.

<sup>5</sup> These are the numerous stamped bricks (20–40 cm. on a side) which were used as revetments or simply as "ex votos." In North Africa the designs found on these are animal and religious scenes and figures, and geometrical patterns. In Spain, geometric designs or Christian symbols such as chrismons, crosses, and doves and peacocks drinking from a Kylix are used. Most of these date from the fourth and fifth centuries but are still used in sixth and seventh century structures. See Schlunk, *Visigodo*, p. 235, and figs. 230, 231, 234.

<sup>6</sup> Schlunk, *Visigodo*, pp. 230–232.

than it is European. It is something more than geography that prevents the Arab from conquering the whole of the peninsula. It is in those northern provinces, nearest to Gaul and to Europe, that the Arab finds himself in alien territory.

Italian Byzantine prototypes were suggested for group JII 3. Artistically such parallels may be seen by comparing the reliefs from Saamasas (Lugo) with the Ravennate Ambon fragment in the Palazzo Rosponi, or with the Ambon of Agnellus.<sup>7</sup> The seventh century San Fructuoso de Montelios (near Braga, Portugal) is most likely a copy of the tomb of Galla Placidia in Ravenna; and the seventh century Santa Comba de Bande (Orense) finds its only parallels in the Sicilian churches of Santa Croce Camerina and Bagno di Mare.<sup>8</sup> Nevertheless, it is to Africa and the eastern Mediterranean that Spain becomes increasingly allied after the fifth century.<sup>9</sup> Leovigild's numismatic reforms as well as his adoption of a distinct regalia are evidence of his turning to Byzantium and not to Rome.

The Guarrazar and Torredonjimeno treasures reveal how well Spanish craftsmen adopted Byzantine methods of setting stones and design motifs. The treasures also reveal the importation of Byzantine jewels and craftsmen.<sup>10</sup> The ex-voto crowns and crosses are in them-

<sup>7</sup> Schlunk, pp. 195-196.

<sup>8</sup> Ibid., pp. 196-199.

<sup>9</sup> The loss of Rome's political prestige and the rise in the status of Byzantium as the only imperial capital must have encouraged this. These non-Roman influences touch all phases of Iberian life.

<sup>10</sup> Schlunk (pp. 201-203) notes the comparable qualities of the articles of these treasures with those of Byzantine ones, e.g., Assiut; and of oriental ones, e.g., Szilagy Somlyo (Hungary). The presence of Greeks or Levantines is not unusual in Spain which from the days of Carthage had connections with the eastern Mediterranean. In the sixth century the large Levantine population both Semitic and Christian is increased by the large immigration of Syrians, which creates problems for the Metropolitan of Tarragona. See King, *Liturgies*, p. 478. Nor is the presence of the imperial troops in the peninsula to be discounted. The Orientals who occupy Spanish Sees: Paul, Felix, Nepopis at Mérida, and Isicius at Toledo must indicate the presence of more of their countrymen (artisans and artists included) living in the peninsula. The travels of Spaniards to the eastern Mediterranean would also account for the importation of objects and ideas. There are many and not the least is St. Leander (d. 596) who passed several years at Byzantium. See Lebrun, II, p. 278. More examples of these connections between Spain and the Near East are to be found in S. Katz, *The Jews in the Visigothic and Frankish Kingdoms of Spain and Gaul*, Cambridge, Massachusetts, 1937.



selves a Visigothic adoption of a Byzantine custom which may have begun with Reccared.<sup>11</sup> The offering of gold and precious stones is particularly identified with the Visigoths by Gregory of Tours and by all the Arab historians of the conquest.<sup>12</sup> Such treasures demand the existence of goldsmiths of top quality, Byzantine or Iberian, particularly in southern Spain. These goldsmiths may be responsible for the unofficial and official striking of many variants of major style groups of Justinian and Justin II. They must be responsible also for the creative inventiveness of the designs of the various style groups in both pre-national and national coinage.

Religious ties between Spain and Africa and the East are seen particularly in the liturgy and in the arrangement of the books of the Bible.<sup>13</sup> The Marial Cultus, responsible for the royal votive crowns and developed in the late sixth and seventh centuries, very definitely depends on Syrian theological and liturgical works.<sup>14</sup> This is only one instance among many.<sup>15</sup> The primary rôle of the Roman

<sup>11</sup> Gregory of Tours (King, p. 478) mentions that Reccared dedicated a crown to the altar of San Felix de Gerona. A full description of the treasures may be found in Menéndez-Pidal, III, pp. 625-630, 631-640. For the use of these votive crowns in Byzantium see Ebersolt, pp. 31-36.

<sup>12</sup> Schlunk, *Visigodo*, p. 312. It is the wealth of Visigothic Spain, perhaps more than the will of Allah, that propels the Arab soldiers forward. Visigothic Spain, regardless of its political decadence, is perhaps the richest center of the arts and letters in the West at this time. For Arab descriptions of the wealth of Spain see Maqqarî, I, pp. 274, 282-283 and Appendix D, XLVII-XLIX, Appendix E, LXX, LXXIX; Menéndez-Pidal, III, pp. 613-615.

<sup>13</sup> Berger, p. 8. With the exception of Irish texts, Spanish Bibles are distinct from all others in Western Europe. The order for the text is unique in the West and basically Hebraic: *ordo legis, ordo prophetarum, hagiographorum, apocryphorum*, and New Testament (p. 26).

<sup>14</sup> St. Ildefonsus, the "Chaplain of Mary," owed much of his *De Virginitate Perpetua* to the writings of the Syrian doctor, St. Ephrem. It is the translation into Latin of the works of the Syrian fathers and direct Syrian influence that encourages the Marial Cultus in Spain. See King, *Liturgies*, p. 551-552. The Cult of the Virgin very early became important in Spain, for in 587 a church was dedicated to Her in Toledo. (E. Hubner, *Inscriptiones Hispaniae Christianae*, p. 49, no. 155, Supplem., p. 74). An illustration of the importance of this cult in Spain is the making of the celebration of the Feast of the Annunciation a part of the Civil Law. See *Lex Visigothorum*, lib. XII, tit. 3, leg. 6. An excellent study of the Spanish Church is Z. García y Villada, *Historia eclesiástica de España*, Madrid, 1929-1932.

<sup>15</sup> King, *Liturgies*, p. 537 (the reciting of the *preces* after the *psallendo*), p. 538 (Baptism ceremonies agree with those of Antioch), p. 543 (ceremony of fire and

Apostolic See in fourth and fifth century religious affairs in Spain is therefore in some respects superceded.<sup>16</sup> Although the Mozarabic Rite was based and developed on Roman lines with local additions and borrowings from Africa and Gaul, the intense national and political nature of the Spanish Church encouraged an independence from Rome. Spanish monasticism, more than any other, an extension of Eastern forms, was partially responsible since most of the bishops who augmented and enriched the liturgy had once been abbots.<sup>17</sup> The Byzantine, Syrian and Coptic liturgical rites that are added to the basic Roman form create a liturgical style which is far removed from Roman sobriety and has a closer affinity to the luxuriance of the Oriental Rites.<sup>18</sup> This liturgy is perfectly suited to the compact, semi-dark and mysterious recesses of extant sixth and seventh century churches. They are more eastern in their orientation, with horseshoe arches, Greek-cross plans, rectangular sanctuaries, and the use of a prothesis and a diaconikon, than any others in the West.<sup>19</sup> Decoration is restricted to the capitals, the altar, the chancels, miscellaneous single strips of reliefs, and in the sixth century is mostly simple geometric patterns or stylized vine and leaf forms. To these motifs may be added the constant appearance of the cross, in its distinctive Maltese-like form.<sup>20</sup>

---

lights on Holy Saturday derives from the usage of the church of Anastasius at Jerusalem), p. 556-557 (Eastern and African saints in the church calendar), pp. 575-576 (the chant of the *Trisagion*), p. 587 (Lenten *laudes*), p. 587 (the formula of dismissal), pp. 600-601 (occurrence of the *ad pacem* and kiss of peace after the offertory but before the anaphora). Another excellent source is Dom G. Prado, *Historia del Rito Mozarabe*, San Domingo de Silos, 1928.

<sup>16</sup> King, *Liturgies*, p. 461. The early close ties between Rome and Spain are evidenced by the letter of Pope Siricius (384-399) to Himerius, Bishop of Taragona in 385, and by the Spanish Bishop Hosius of Córdoba presiding in the name of the Pope at the Council of Nicea (325). See Denzinger, *Enchiridion Symbolorum*, (Friburg, 1937), pp. 42-45.

<sup>17</sup> De Urbel, I, part II, cap. XIV, p. 484.

<sup>18</sup> King, *Liturgies*, p. 478.

<sup>19</sup> Ibid., p. 469. Also see Schlunk, *Visigodo*, pp. 275, 292-294.

<sup>20</sup> The importance of the cross in Spain is evidenced by the appearance of it on coins, by the universal use of it and by the prescribing of the Invention of the Cross (3 May) as one of the principal feasts of the year. See *Lex Visigothorum*, lib. XII, tit. III, leg. VI. For the later important use of crosses, as offerings, see Schramm, II, pp. 482-483.


Since Eastern and African influences are dominant, it is not surprising that the major sixth century artistic centers are to be found in southern Spain, in Lusitania and Baetica. The importance of Mérida, Seville and Córdoba is clearly noted in their dominance of the numismatic style groups of late Justinian and Justin II, and of the Zorita Hoard. Their mints have an active rôle in the resolution of the design of the obverse portrait bust and the insect Victoria. Until Toledo, as *urbs regis*, will dominate at the end of the sixth and the seventh centuries, Mérida, Seville and Córdoba are the artistic capitals of Spain. Mérida, as no other, is intensely influenced by Byzantine forms, encouraged by its Greek bishops, Paul (530? to 560), and Fidel (560–71) and by their building activities.<sup>21</sup> Fragments of chancels, niches and pilasters from Mérida are distinguished by their delicate workmanship and by the rich variety of their decorative flora and fauna motifs. Artists in Mérida as in Andalucía work with great skill and sophistication (PLATES E, F), worthy of the elaborately decorated portrait bust of groups JAN 4 and JII 4. Córdoba and Seville produce objects closely related to the Byzantine-influenced pieces of Mérida. The fineness of the Córdobaan cimacios with beautifully designed geometric and floral patterns attest to the high quality of the technical performance of the Andalucían artisan (PLATE G). The propensity for sumptuous elegance and lyrical beauty is evident in the coins of JII 2 and JII 3.

A general similarity in carefully organized, balanced, repeatedly stylized linear patterns and their manner of execution exists between sixth century coins and sculptural relief fragments. Coins are our only sixth century examples of human representation. The few sculptural reliefs of human figures are all seventh century. There is a continuity, however, and a similarity in approach when the coins are compared with the reliefs from San Pedro de Nave and Santa Maria Quintanillas de las Viñas (PLATES G, H). In the tetramorph capital at Córdoba, the precision of the bold contour, the hard outline, and the repeated linear pattern, such as in the folds of the evangelist's robe, is reminiscent of the design quality on the coins (PLATES J, K). The reliefs at Quintanillas de las Viñas, e.g., the

<sup>21</sup> Schlunk, *Visigodo*, p. 249. This involved among other things the Cathedral of Santa Jerusalem and the enlarging of Santa Eulalia.

"Blessing Christ" and the "Glorification of Christ," are even more related to the numismatic art. There are only three planes to the relief. The manner of achievement creates a successful decorative balance between the necessary maintenance of the two dimensional architectural surface and the three dimensional illusion didactically necessary to establish the figures in space. The void or space around the figures, the lower plane of relief, leaves the contours of the figures on the surface plane. The void is cut back deeply enough to assert the figure in dark and light. The features and the garment folds are deeply cut, half as deep as the background plane, and create incisive dark patterns of lines. There is no gradual modeling, only a constant cubistic repetition of the same three planes.

While the accents on the raised relief of the figure contrasted with the deep void produces an illusion of three dimensions, the rigid static repetition of dark and light across the surface maintains the two dimensional function of the wall and of the decoration. At no instance is the light permitted to hit a graduated or rounded surface. The contours of the figures are cut perpendicular to the wall surface. The spatial device and illusion is not unlike that used by Picasso in his early cubistic works. The cutting out of the facial features, the nose and the eyes, does not detract from the geometric purity of the planes. In the "Christ in Glory," the area of the neck immediately below the chin has been gorged out to give prominence to the head and to help fortify, for the sake of contrast, the three dimensional illusion of the figure. The boldness and simplicity of the relief technique is similar to the relief quality of the coin. The raised linear relief that distinguishes the design of the types on the coins produces the same two dimensional effect as the sharp dark and light contrast on the linear surface of the reliefs. The coin is like a pencil-tracing of the sculptured relief. The decorative approach to abstraction of the human figure is exactly similar to the conception of the mint designers. Note the treatment of the halo and the hair of Christ. One is simply a parallel extension of the other; the resulting form can stand totally as a halo or as a halo and hair. The uniting of two separate forms as one, still permitting the possibility of reading them as two, further simplifies the design by reducing the number of different elements. On the coins, this was practiced successfully in the

reduction of the unintelligible, garbled legend into an intelligible decorative abstraction. It was seen also in the development of the chest  with balanced fibulae, and in the development of the insect Victoria. The boldness and severity and simplicity of this finally resolved abstract design of the INCLITUS REX creates as it does in the sculptural fragments an austere, impersonal, aloof, forceful icon.

Although these reliefs at Quintanillas are always compared to the altar reliefs at Pemma (Cividale, ca. 740), to which they undoubtedly are similar, there is a very distinct difference in conception of design. The Italian reliefs are more sumptuous, more alive, more human, more busy with decorative elements and extraneous objects as well as more varied in depths of the sculptural planes. The suggestion of modeling, however slight, makes the Pemma reliefs rounder, softer and more lyrical. This is far removed from the formalism of the Spanish works.

This linear quality of almost unrelenting simplicity and austerity is seen particularly well in the manuscript illuminations of the early Toledan School. In the Bible of León Cathedral dated 920, the figures are bold, filled with primitive vigor, rigid bodies, impersonal without expression. The asperity of these illustrations is relieved by the originality of the inventiveness of the stylized forms that constantly revolve between the real and the abstract such as representing the profile and frontal view of the face simultaneously. Does this not equally describe the quality of the INCLITUS REX coin and the types of the mints of Toledo, the Tarraconensis and Narbonne? Even the colors are strong; cerise, yellow, black, green and blue to intensify the impact.<sup>22</sup> Andalusian illuminations, as might be expected from what occurs on the coins, are more Oriental with fewer miniatures, with richer decorations of formal floral motifs and "ataurique" patterns, and more delicately colored.<sup>23</sup> A good example of this is the tenth century *Biblia Hispalense* (Codex Toletanes) (PLATE L).

Spanish books such as these of the tenth century are part of a long tradition that extends back into the sixth century, although manuscripts of this time are not extant. Most likely a relic of Isidor-

<sup>22</sup> Bordoña, *Spanish Illumination*, p. 8.

<sup>23</sup> *Ibid.*, p. 10.

ian culture, the *Ashburnham Pentateuch* gives an idea of what sixth and seventh century illuminations were like. The simplicity of the illumination, the careful organization of compositions into rectangular and square frames, and outlined figures against strong monochrome backgrounds of red, green, or blue are reminiscent of the aesthetic approach of Spanish minters.<sup>24</sup> Non-illuminated Visigothic manuscripts of the seventh century with simple, clear red and black initials also reflect the compactness and order of design that is also at work in the mints.<sup>25</sup>

A silver box (PLATE C) in the National Museum of Archaeology in Madrid which may be late sixth or seventh century is the only object I know which, like the coins, presents a royal profile portrait. It is a larger version of what might have been the model for the INCLITUS REX obverse die. It is more naturalistically rendered with a limited amount of modeling, but the patterns are handled so as to achieve a flattened effect. The raised relief surface is fairly flat, almost in a single plane. The handling of the face is meagre but sufficient enough to distinguish the planes of the nose, the cheek and the chin. Stylized touches such as the rope hair, the beautifully curved line for the ear, the vigor and sweep of the curving folds of the paludamentum, and the indeterminate ribbon or vine form at the back of the figure are in accordance with the best traditions of the art of the Visigothic age. The spatial arrangement is not unlike that of the Quintanillas de las Viñas relief and the sixth century coins.

The qualities of originality and invention are the attractive elements of Spanish art. Any of the numerous style groups represents a totally conceived symbol, a kind of resolved linguistic formula of its own. The variety may be confusing, but the consistency of the quality of the design and the underlying uniformity are astounding. This is also true for the portraits on the coinage of the national period. The object, to create a symbolic royal portrait, is achieved in a generalized, anonymous, abstract form, without losing its human identity. This process is reversed for the striding Victory whose pagan identity is forever lost in her final dehumanization. Never-

<sup>24</sup> Ibid., p. 5.

<sup>25</sup> Ibid., pp. 2-5.

theless, she is the most magnificent creation of the sixth century designer. Her equals in the world of the phantasmagorical may be found only in those magnificent zoomorphic forms in Beatus manuscripts and Spanish Romanesque art. She is truly a Spanish creature, worthy of the best of Picasso.

The obverse and reverse designs of the INCLITUS REX coin are a vivid illustration of Hispano-Roman-Gothic art. They are the product of conscious design, evolving naturally through various stages from the original natural form. They are not barbaric accidents but aesthetic objects of a new age. They objectify what has happened to the culture of the ancient pagan world. They are after all transformed Roman forms and symbols. What has happened on these coins has happened in all other disciplines. Although transformed, the pagan VPW has had its fitting end as a numismatic type in Spain. "*El sol del Mundo Antiguo parece haber dado un último destello en esta avanzada de Occidente que es España, antes de extinguirse para siempre.*"<sup>28</sup>

<sup>28</sup> Schlunk, *Visigodo*, p. 306.

## THE CORPUS





## ANASTASIUS GROUPS\*

### GROUP A I

1. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTORIA AVCVSTORVAI      CONOB  
1.52 ↓ HSA 16708
2. *Obv.*: DNANSTA SIVSPFAVC  
*Rev.*: VICTORIA AVCVSTORVAI      CONOB  
1.51 ↓ ANS
3. *Obv.*: DNANASIA SIVSPFAVC  
*Rev.*: VICTORIA AVCSTORVN      CONOC  
1.49 ↓ HSA 16705  
The only other coin that I know like this is one in the Grierson Collection, which I have seen only in a photograph. It appears to be of the same die. Legends read: DNASTA SIVSPFAVC; VICTORIAA VCVSTORVMI; CONOC.
4. *Obv.*: DNANASTASIVS PFAVC  
*Rev.*: VICTORIA AVCVSTONVP      CONOB  
1.47 ↓ Mateu y Llopis, pl. II, 10
5. *Obv.*: DHANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVGVSTORVMA      CONOB  
1.495 ↓ PBN
6. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVAI      CONOB  
1.48 ↓ PBN, Alesia Hoard
7. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA ///////////////      CON/////  
1.55 ↙ HSA 16682

\* Unless otherwise specified, both obverse and reverse types face right. Unless otherwise indicated the transcription of legends of coins in the Madrid Catalogue of Mateu y Llopis is in accordance with his text except for the following changes: (1) all recorded A are put into the form as they appear on the coin Λ and (2) all reversed letters are recorded as they appear on the coins. Mateu y Llopis edited the coin legends instead of recording them as they appeared on the coins.

8. *Obv.*: DNANAS ////////////// PPAVC  
*Rev.*: VICTORIA AVCVSTONA CONOB  
 1.485 ↘ PBN, Gourdon Hoard
9. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTORIA AVGVSTORVA CONOB  
 1.48 ↓ HSA 16693
10. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTONVA COMOB  
 1.50 ↓ HSA 16696
11. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTORIA AV/////STONVA COMOB  
 1.47 ↓ HSA 16716
12. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA COMOB  
 1.50 ↓ HSA 16695
13. *Obv.*: DNANASTA SIVSPPAVG  
*Rev.*: VICTORIA AVCVSTORVA CONOB  
 1.50 Mateu y Llopis, pl. II, 12  
 Final letter of obverse legend and third letter of reverse (AVCVSTORVA)  
 might be read G or C.
14. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVA CONOB  
 1.50 ↓ HSA 16710
15. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA COMOB  
 1.48 Mateu y Llopis, pl. II, 11  
 Final letter of obverse legend and third letter of reverse (AVCVSTORVA)  
 might be read G or C.
16. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORIA CONOB  
 1.51 ↓ HSA 16706
17. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA ////////////// CVSTORIA CONOB  
 ↓ DIC

18. *Obv.*: DNANASTA SIVSPPVAC  
*Rev.*: VICTORIA AVCVSTORVA CONOB  
 1.465 ↓ PBN
19. *Obv.*: DNA2NA STA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORNA COMOB  
 1.48 ↓ HSA 16681
20. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTONA CONOB  
 1.47 Mateu y Llopis, pl. II, 13  
 Final letter of obverse legend and third letter of reverse (AVCVSTONA)  
 might be read G or C.

## GROUP A 1a

21. *Obv.*: DNANASTA SIVSPPIAVC  
*Rev.*: VICTORIA AVCVSTONVA CONOB  
 1.48 ↓ HSA 16746
22. *Obv.*: DNANSTA ASIVSPPIAVC  
*Rev.*: VICTORIA AVCVSTORVA CONOB  
 1.47 ↓ PBN
23. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVCOTV CONOB  
 1.44 ↓ PBN
24. *Obv.*: DIIANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTONV CONOB  
 1.47 ↓ PBN, Gourdon Hoard  
 The exergue letters appear upside down and become part of the reverse legend.
25. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVAI CONOB  
 1.51 ↓ HSA 16687
26. *Obv.*: DNANASTA SIVSPPC  
*Rev.*: VCTOR ACVSTORVI CONOB  
 1.46 ↓ PBN  
 B in CONOB is placed on the line of the exergue as if it were a final reversed letter B of the reverse legend.

## GROUP A 1b

27. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTOR /////////////// VSTORVII: COMOB  
 √ in right reverse field  
 1.55 ↓ HSA 16718
28. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTOR AVCVSTORVM CONOB  
 √ in right reverse field  
 1.51 ↓ PBN

## GROUP A 1c

29. *Obv.*: DNANASTA + SIASPPAVC  
*Rev.*: VICTORIA AVGVSTONVA CONOB  
 T in left reverse field  
 1.46 ↓ HSA 16719
30. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTONVA ONOB  
 T in left reverse field  
 1.46 ↓ PBN  
 Same die as 29.

## GROUP A 1d

31. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVM CONOB  
 D in left reverse field  
 1.43 ↓ PBN

## GROUP A 1e

32. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: // RIA AVCVSTORV ////////  
 P in right reverse field  
 1.395 ↓ PBN  
 Damaged edge of coin and mis-striking of reverse die have caused deletion of first letters of reverse legend and exergue letters.
33. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: // VSTORVAI COMOB  
 P in right reverse field  
 1.48 ↓ HSA 16679

## GROUP A If

34. *Obv.*: DNANASTIVSPΛV  
*Rev.*: VICTOR IΛΛVCV CONOB  
 B in right reverse field  
 I.47 ↓ PBN, Alesia Hoard

## GROUP A Ig

35. *Obv.*: DNANASTA ISPPΛVC  
*Rev.*: VICTORIA VCVSTORV ONOB  
 S in right reverse field  
 I.52 ↓ PBN

## GROUP A Ih

36. *Obv.*: DNANASVA SIVSPΛVC  
*Rev.*: VICTORIA ΛVCVSTORVM COMOB  
 Ϻ in left reverse field  
 I.49 ↓ PBN

## GROUP A Ii

37. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA ΛVCVSTON CONOB  
 I.47 ↓ LBM

## GROUP A Ij

38. *Obv.*: CHAHASTA SIVSPPAVC  
*Rev.*: VICTORIA ΛVCVSTORA CONOB  
 I.46 ↓ LBM
39. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORA ΛVCVSTORVM CONOB  
 I.445 ↓ PBN, Gourdon Hoard  
 Last three letters of reverse legend difficult to read. May read: ΛVII  
 or ΛVIH.
40. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA ΛΛVGSTORVA CONOB  
 I.50 ↓ PBN, Gourdon Hoard

41. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORI COMOB  
 1.495 ↓ PBN  
 Letters in exergue fairly illegible.

## GROUP A 2

42. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVM COMOB  
 1.46 ↓ ANS, ex Reinhart Coll., cf. Ratto 2472  
 Last letter of reverse legend may read Λ for M.
43. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA COMOB  
 1.50 ↓ HSA 16684
44. *Obv.*: DHANASTASIVS PPAVC  
*Rev.*: VICTORIA AVCVSTORVV COMOB  
 1.46 ↓ PBN, Gourdon Hoard
45. *Obv.*: DNANAST // // // // IVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVV COMOB  
 1.46 ↓ PBN

## GROUP A 2a

46. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTO // // // // // // // ORVI COMOB  
 1.50 ↓ HSA 16689
47. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVI COMOB  
 1.45 ↓ PBN, Alesia Hoard
48. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVI COMOB  
 1.46 ↓ PBN, Gourdon Hoard
49. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVI COMOB  
 1.43 ↓ PBN

50. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVI  $\overline{\text{COHOB}}$   
 Tolstoi, II, p. 213, no. 155; Lenormant 1848, pl. X, 5
51. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA  $\overline{\text{COHOB}}$   
 1.46 ↓ PBN
52. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA  $\overline{\text{CONOB}}$   
 1.49 ↓ HSA 16680
53. *Obv.*: DNANASTASIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA  $\overline{\text{COMOB}}$   
 VQR 4990  
 VQR Catalogue records a star in right reverse field. This is in error. It is only the front section of the palm branch.
54. *Obv.*: DNANASTASIVSPPAVC  
*Rev.*: IOTORIA AVCVSTORVA  $\overline{\text{COMOB}}$   
 VQR 4991
55. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVCVSTORVA  $\overline{\text{COHOB}}$   
 1.48 ↓ HSA 16690

## GROUP A 2b

56. *Obv.*: DNANAZTA IVSPPAV  
*Rev.*: VICTORIA AVCVSTORVI  $\overline{\text{COMOB}}$   
 1.46 ↓ LBM
57. *Obv.*: DNANASTA SIVSPPAV  
*Rev.*: VICTORIA AVCVSTORVA  $\overline{\text{COMOB}}$   
 1.46 ↓ PBN
58. *Obv.*: DNANAST ASIVSPPC  
*Rev.*: VICTORIA VCTORVM  $\overline{\text{CO}}////$   
 1.49 ↓ HSA 16691
59. *Obv.*: DNVNA TIVSPPAV  
*Rev.*: VICTORIA VCTORVN  $\overline{\text{COHOB}}$   
 1.52 ↓ HSA 16713



## GROUP A 2c

60. *Obv.*: CHΛHASTΛ VSPPAVC  
*Rev.*: VICTORIA ΛCVSTO NO  
 1.445 ↓ PBN, Gourdon Hoard
61. *Obv.*: CNANAST ASIVSPA  
*Rev.*: VCTO Λ VCVSTO |||||  
 Illegible letter in right reverse field: S, D or *ρ*.  
 1.43 ↓ PBN
62. *Obv.*: IΛVITA SIVOVIIVC  
*Rev.*: VICTORI ΛCVSTO |||  
 1.45 ↓ LBM
63. *Obv.*: IΛVITA SIVOVIIVC  
*Rev.*: VICTORI ΛCVSTO |||  
 1.44 ↓ LBM
64. *Obv.*: IΛVITA SIVOVIIVC  
*Rev.*: VICTORI ||||| VITO IVI  
 1.47 ↓ HSA 16688

## GROUP A 3

65. *Obv.*: DNANASTAS VI2APPAVC  
*Rev.*: VICTORIA ΛVCVSTOR·T· CONOB  
 1.45 ↓ HSA 16683
66. *Obv.*: CHΛHST ||||| SPPA VC  
*Rev.*: VCTORIA IΛCVSTOIA CONOB  
 1.448 Barcelona 2
67. *Obv.*: DNANASTAS VI2APPAVC  
*Rev.*: VICTORIA ΛVCVSTOR·T· CONOB  
 1.46 ↓ LBM
68. *Obv.*: CNANASTA VISAPPAVC  
*Rev.*: VICTORA ΛVΛVSTOR·T· CONOB  
 1.40 Mateu y Llopis, pl. II, 15
69. *Obv.*: CNANASTA ΛIVSPPA VC  
*Rev.*: VICTORII ΛIVGVSTORA CONOB  
 DO, See also VD J, Mateu y Llopis, pl. VII, 181.  
 Coin of this type in Grierson Coll. Legends read: CNANASTA IVSPPA VC;  
 VCTORI VCVSTOIA; CONOB.

70. *Obv.*: ДИΛΙΣΤΑ VISPPΛVC  
*Rev.*: VCTЯA IΛVCVSTORA CONOB  
 I.47 ↓ HSA 16773
71. *Obv.*: DNANASTA ISPPΛVC  
*Rev.*: VCTORI ΛVCVSTOIA CONOB  
 I.45 ↘ HSA 16737
72. *Obv.*: ДИΛΙΣΤΑ IISPPΛVC  
*Rev.*: VCTORII IICVSTOIA CONOB  
 I.44 ↙ PBN, Alesia Hoard
73. *Obv.*: DNANA // // // // // // // IISPPΛVC  
*Rev.*: VCTORII VΛVCVSTOIA CONOB  
 I.35 ↓ LBM
74. *Obv.*: DNANASTA OAPPAVC  
*Rev.*: VICTORIA ΛVCVSTORA CONOB  
 Ashmoleon  
 Second half of reverse legend may read: ΛVCVSTONA.
75. *Obv.*: DNANASTA VSTARVΛVC  
*Rev.*: VICTORIAI VΛICVΣTOЯV CONOC  
 I.43 ↓ HSA 16714
76. *Obv.*: ДИΛΙΛΣΤΑ VIΣAPPAVC  
*Rev.*: VICTORVI ΛCAVΛVΣTOR CONOC  
 I.45 ↓ LBM
77. *Obv.*: ДИΛΙΛΤΙΑ ΛVΣIIΛVC  
*Rev.*: VICTORA ΛVCV // // // // // OIVN CONOB  
 I.38 ↓ HSA 522
78. *Obv.*: ДИΛΙΛΤΑ ΛVΣPPΛVC  
*Rev.*: ICTYΛIA ICTI // // // // // CONO//  
 I.44 ↓ LBM
79. *Obv.*: ДНИHSIA VVSPPAVC  
*Rev.*: VCTORA IΛVCVSTOIA CONOB  
 I.46 ↓ PBN, cf. Tolstoï, II, p. 213, no. 516; Lenormant 1848, pl. X,7
80. *Obv.*: ДHANAСТА SIVSPPAVC  
*Rev.*: VICTORIA ΛΛVCVSTRAI CONOC  
 I.45 ↓ LBM

81. *Obv.*: DNANASTA IVSPPAVC*Rev.*: IVCTORI ////////////// OVSTOIA COII

1.44 ↓ LBM

What appears to be an overstrike in the obverse inscription makes the reading uncertain.

82. *Obv.*: DNVHVATS VAVSPFAVC*Rev.*: ICTIAII TOIVAA CONOC

Tolstoï, II, p. 214, no. 157; Lenormant 1853, pl. XVI, 2

## GROUP A 3a

83. *Obv.*: DIANASTA SIVSPPAVC*Rev.*: VICTOIA AVCTONA CONOB

1.42 ↓ PBN, cf. Tolstoï, II, p. 214, no. 157; Lenormant 1853, pl. XV, 2

84. *Obv.*: DIANSTA AVTPIAC*Rev.*: ONAAIVSTONVA CONOB

1.52 Mateu y Llopis, pl. II, 16

## GROUP A 3b

85. *Obv.*: DNANASTAS IVSPPAVC*Rev.*: VICTORIA AVCVSTORVM COMOB

2 in right reverse field

1.44 ↓ ANS, ex W. Reinhart Coll.

86. *Obv.*: DNANASTAS IVSPPAVC*Rev.*: VICTORIA AVCVSTORVM////////N////////

S in right reverse field

1.44 ↓ LBM

Tops of letters on first half of obverse legend worn or lost with cut off edge, so that reading may not be correct. Inscription in exergue damaged. Only letter N can be discerned.

87. *Obv.*: DNVN2TAS IVSPPAVC*Rev.*: VICTOPIA ACV2TOR CONOB

S in right reverse field

1.45 ↓ PBN, Alesia Hoard, cf. Tolstoï, II, p. 214, no. 160; Lenormant 1853, pl. XV, 9

88. *Obv.*: DNANAST + ISIVSPPAVC*Rev.*: VICTORA AVCTORVA CONOB

S in right reverse field

1.37 ↓ PBN

## GROUP A 3c

89. *Obv.*: DNANA //////////////// IVSPPAVC  
*Rev.*: VICTORIA VVS LORA ONÖ  
 ϳ in left reverse field  
 1.42 ↓ PBN

## GROUP A 3d

90. *Obv.*: DNANASTASIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVA CONÖB  
 N in right reverse field  
 1.44 ↓ PBN
91. *Obv.*: DIIAHASTASIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVA CONÖB  
 N in right reverse field  
 1.41 ↓ PBN, Alesia Hoard
92. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVIA CONÖS  
 N in right reverse field  
 1.38 ↓ LBM

## GROUP A 3e

93. *Obv.*: DIIIIA2TA2IV2PAC  
*Rev.*: VICTORIA VCV2T CONÖD  
 1.40 ↓ PBN, Gourdon Hoard  
 Unusual letter D in exergue most likely a result of minter's misreading of a worn B.

## GROUP A 4

94. *Obv.*: DIIANASTA SIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVA CONÖB  
 1.17 ↓ PBN, Gourdon Hoard
95. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA VCVSTORVA CONÖB  
 1.45 ↘ HSA 16747

96. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA ///// CVSTORVA CONOB  
 1.49 ↓ HSA 16685
97. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA AVGVSTORVA CONOB  
 1.44 ↓ PBN, Alesia Hoard
98. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORAAV CVSTORVM CONOS  
 Tolstoi, II, p. 214, no. 158; Lenormant 1853, pl. XV, 4

## GROUP A 4a

99. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA + AVCVSTORO CONOB  
 1.48 ↓ HSA 16717
100. *Obv.*: DNANAST SIVSPPAVC  
*Rev.*: VICTORIA + AVCVSTORO CONOB  
 1.50 ↓ HSA 16692

## GROUP A 4b

101. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTOI IA AACVSTORI TONOI  
 Ashmoleon
102. *Obv.*: DNANASTA + SIVSPPAVC  
*Rev.*: VICTORTAA AASTORIA CONO  
 1.47 ↓ PBN

## GROUP A 5

103. *Obv.*: DNANASTA SIVSPRNO  
*Rev.*: IVCTORIAAV // CONOB  
 in right reverse field  
 1.47 ↓ HSA 16699

104. *Obv.*: DNANASTA SIVSPRNC  
*Rev.*: IVCTO //VTOVM  $\overline{\text{CONOB}}$   
 Ɱ in right reverse field  
 1.47 ↓ HSA 16704
105. *Obv.*: DNANASTA SIVSPRNC  
*Rev.*: IVCTORΛΛVCVSO  $\overline{\text{CONOB}}$   
 Ɱ in right reverse field  
 1.42 ↓ HSA 16703
106. *Obv.*: DNANASTA SIVSPRNC  
*Rev.*: IVCTO //COVTM  $\overline{\text{CONOJ}}$   
 Ɱ in right reverse field  
 1.36 ↓ HSA 16702
107. *Obv.*: DNANASTA SIVSPPNC  $\overline{\text{CONOD}}$   
*Rev.*: VICTORIAΛVCVTORVN  
 Ɱ in right reverse field  
 1.48 ↓ HSA 16701
108. *Obv.*: DNANASTA SIVSPPAC  
*Rev.*: VICTORIAΛVCVTORVM  $\overline{\text{COMOB}}$   
 Ɱ in right reverse field  
 1.57 ↓ HSA 16698
109. *Obv.*: DNANASTA SIVSPPNC  
*Rev.*: VICTORIA VOCTORVM  $\overline{\text{COMOB}}$   
 Ɱ in right reverse field  
 Tolstoï, II, p. 213, no. 153; Lenormant 1848, pl. VIII, 2
110. *Obv.*: DNANASTASIV // □  
*Rev.*: VICTOR //  $\overline{\text{CON}}////$   
 Ɱ in right reverse field  
 1.45 ↓ HSA 16707
111. *Obv.*: DNANASTA SIVSPRNC  
*Rev.*: VICTORIA ΛVCVTOR //  $\overline{\text{CONOB}}$   
 Ɱ in right reverse field  
 1.46 ↓ HSA 16697
112. *Obv.*: DNANASTASIVS PRNC  
*Rev.*: IVCTORIA V COVRM  $\overline{\text{CONOB}}$   
 Ɱ in right reverse field  
 VQR 4992

## GROUP A 5a

113. *Obv.*: DNANASTA SIVSPRAVC  
*Rev.*: VICTORIA Λ CITOVM CONOB  
 ⸥ in right reverse field  
 1.50 Mateu y Llopis, pl. II, 7
114. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VICTORIA VOCTORVM COMOB  
 ⸥ in right reverse field  
 Tolstoï, II, p. 213, no. 154; Lenormant 1848, pl. VIII, 7
115. *Obv.*: DNANASTA SIVSPAVC  
*Rev.*: ////////// CTORIA ΛVCOTOV Cut off  
 ⸥ in right reverse field  
 1.48 ↓ HSA 16738

## GROUP A 5b

116. *Obv.*: DNANASTISIVSPPAV  
*Rev.*: VICTORIA VVCSO ////////// ONOB  
 T in right reverse field; > in left reverse field  
 1.35 ↓ PBN, Alesia Hoard

## GROUP A 6

117. *Obv.*: DNANΛ2TA2IV2PFV  
*Rev.*: VICTORIAΛVCCTORVMI CONOB  
 1.43 ↓ HSA 16709
118. *Obv.*: DNANASTASIVS PRFAVC  
*Rev.*: VICTORIA ΛCVSTORVM CONOB  
 1.46 Mateu y Llopis, pl. II, 9
119. *Obv.*: DNANASTASIVSPPFΛV  
*Rev.*: VICTORIAΛCVSTORVM CONOB  
 1.45 Tolstoï, II, p. 212, no. 151
120. *Obv.*: DNANASTASIVSPRFΛI••  
*Rev.*: VICTORIA ΛVCCTORVMI CONOB  
 Tolstoï, II, p. 212, no. 152; *BMCVOL*, p. 11, no. 7, pl. II, 8

121. *Obv.*: DNANASTASIVSPRFΛV  
*Rev.*: VICTORIA ΛCVSTORVM CONOB  
 1.43 ↓ *BMCVOL*, p. 10, no. 2, pl. II, 7
122. *Obv.*: DNANASTA IVSPΛVC  
*Rev.*: VICTORIA IC //////////////// CONOB  
 1.43 ↓ PBN
123. *Obv.*: DNANASTA SIVSIIΛVC  
*Rev.*: VICTORIA COSITΛVM  
 1.38 ↓ HSA 16700
124. *Obv.*: DNANASTASIVS PRFΛVP  
*Rev.*: VICTORIA ΛVCCTORVM COMOB  
 1.44 Mateu y Llopi, pl. II, 8

GROUP A 6a

125. *Obv.*: DNAASTA SIVSTINC  
*Rev.*: VICTORIA ΛVCTORVM COM////////  
 R in left reverse field  
 1.49 ↓ HSA 16715  
 Letter in reverse field difficult to read. May be S or B. Unlikely that it would be a damaged monogram.

GROUP A 6b

126. *Obv.*: DNANAS· TASIVSPP  
*Rev.*: VICTORIA ΛVCC CONOC  
 N (?) in left reverse field; Λ in right reverse field  
 1.47 ↓ HSA 16740  
 Letter in left reverse field illegible, recorded N only a suggestion.

GROUP A 6c

127. *Obv.*: //////////////// STA ////////////////  
*Rev.*: VI //////////////// TORVM CONOC  
 M in right reverse field  
 1.47 ↓ HSA 16767

GROUP A 7

128. *Obv.*: DNANASTA SIVSPFΛVC  
*Rev.*: VICTORIA ΛVCVSTORVM COMOB  
 1.45 Tolstoi, II, p. 210, no. 135  
 Victoria on reverse stands on a globe, faces right.



129. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTORIA ΛVCVSTORVM COMOB  
 1.45 Tolstoi, II, p. 210, no. 136  
 Victoria on reverse stands on a globe, faces left.
130. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTORIA ΛVCVSTORVM COMOB  
 1.477 *BMCVOL*, p. 56, no. 71, pl. VII, 3
131. *Obv.*: DNANASTA SIVSPFAVC  
*Rev.*: VICTORIA ΛVCVSTORVM COMOB  
 1.398 *BMCVOL*, p. 56, no. 72, pl. VII, 4  
 Victoria on reverse stands on a globe, faces left.

## JUSTIN I GROUPS

## GROUP JI 1

132. *Obv.*: DNIVSTN· V2PFAIVC  
*Rev.*: VICTORIA ΛVCV2TORVΛΛ COMOB  
 1.37 ↓ ANS, ex W. Reinhart Coll.
133. *Obv.*: CNV2TIN V2PFAVIC  
*Rev.*: VICTORIA ΛVCV2TORVΛB COMOB  
 Ashmoleon  
 Reversed B at end of reverse legend awkwardly placed askew at line of exergue. May be mistakenly connected, reading COLIOBB. Two coins of this type in VD J, Mateu y Llopis, pl. VII, 184-185.
134. *Obv.*: CNIVSTIN VSPFAVIC  
*Rev.*: VICTORIA ΛVCV2TORVA COMOB  
 1.24 ↓ HSA 16723
135. *Obv.*: CNIVSTIN VSPFAVBC  
*Rev.*: VICTORII ΛVCVSTORIAIΛB COMOB  
 1.44 ↓ LBM
136. *Obv.*: CNV2TIN VSPPAVBC  
*Rev.*: VICTORIA Λ·VCV2TORVI COMOB  
 1.43 ↓ HSA 16722
137. *Obv.*: CIIIA2TIIA· 2PPAIC  
*Rev.*: VICTORVA //////////////// STORVΛB COMOB  
 1.43 ↓ PBN, Alesia Hoard  
 Same obverse die as 138.

138. *Obv.*: IIIA2TIIA 2PPAVIC  
*Rev.*: VICTORIA A·C·TORVAI CONOB  
 1.43 ↘ PBN  
 Same obverse die as 137.
139. *Obv.*: IIIA2TIIA 2PPAVIC  
*Rev.*: VICTORIA· CVSTORVAI CONOB  
 1.42 Barcelona 8  
 Amorós and Berruezo record the legend: DNIA2TNIA2PPAVIC ;  
 VICTORIAICVSTORVM; ONO.
140. *Obv.*: DNVTIN V2PPAVIC  
*Rev.*: VICTORVA AVCVSTORVAI CONOB  
 PG
141. *Obv.*: DNVTIN·V2FPAVIC  
*Rev.*: VICTORIA VISTORVAI CONOB  
 1.50 Mateu y Llopis, pl. III, 18
142. *Obv.*: DNVTIN V2FPAVIC  
*Rev.*: VICTORIA AVCV2TORIAI CONOB  
 1.45 ↓ PBN, Alesia Hoard
143. *Obv.*: DNIV2TI NV2PPVAC  
*Rev.*: VICTORVA ACV2TORVA CONOB  
 1.425 ↘ PBN
144. *Obv.*: DNIVST INVSPPAVIC  
*Rev.*: VICTORIA ACV2TORVA CONOB  
 1.44 LBM
145. *Obv.*: DNIVSTINVSPPAVCC  
*Rev.*: VICTOR IA AVCVSTORV CONOB  
 VQR 4994
146. *Obv.*: DNIV2TIN V2PPAVC  
*Rev.*: VICTORIA ACV2TORAV CONOB  
 1.46 LBM
147. *Obv.*: DNIV2TIN V2PFAVC  
*Rev.*: VICTORVA ACV2TORVA CONOB  
 1.05 Mateu y Llopis, pl. III, 17
148. *Obv.*: DNIV2TI NV2PPAC  
*Rev.*: VICTORIA ACV2TORVA CONOB  
 1.40 Mateu y Llopis, pl. III, 21

15\*

149. *Obv.*: DNIVZTI NVSPPAVC  
*Rev.*: VICTORVA ACVSTORVA  $\overline{\text{CONOB}}$   
 1.50 Mateu y Llopis, pl. III, 22
150. *Obv.*: DNIVST //////////////// NVSPPVC  
*Rev.*: VICTOR //////////////// CVSTORVAI  $\overline{\text{CONOB}}$   
 1.40 ↓ PBN, Alesia Hoard
151. *Obv.*: DNIVZTI NV2PPAVC  
*Rev.*: VICTORIA ACVSTORVA  $\overline{\text{CONOB}}$   
 1.43 ↓ PBN, Alesia Hoard
152. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORI VSTORAVI  $\overline{\text{CONOB}}$   
 1.43 ↓ PBN, Alesia Hoard
153. *Obv.*: DVSTIA· + NICISIC  
*Rev.*: IVAVI N CISVPV  $\overline{\text{OIII O}}$   
 1.44 ↓ ANS, ex W. Reinhart Coll.
154. *Obv.*: CVSTIA ··NICIVIC  
*Rev.*: ICVAI VVICVO  $\overline{\text{OIH B}}$   
 1.385 ↓ PBN, Gourdon Hoard
155. *Obv.*: DVSTIA NICIRIVIC  
*Rev.*: CVICTOPI VLASTOV  $\overline{\text{OIH O}}$   
 VQR 5001
156. *Obv.*: DVITV VNICSIC  
*Rev.*: VDTV ꝛ NICIC  $\overline{\text{CONOC}}$   
 1.40 VD J, see Reinhart, *DJN* 1940, pl. 9, 12  
 Reinhart reads the legends: DVVIV VNIC2IC ; DTVVNICIC ;  $\overline{\text{CONOC}}$ .
157. *Obv.*: DVSTIA ··HICIVPC  
*Rev.*: ICVAIV VICVIO  $\overline{\text{OIN B}}$   
 1.34 ↓ LBM
158. *Obv.*: DVSTINI ITVPIAVC  
*Rev.*: VISV VIRSNVI  $\overline{\text{CONOC}}$   
 1.43 ↓ HSA 519
159. *Obv.*: DVSTI··· NICAPRVC  
*Rev.*: AISVI VIARSN  $\overline{\text{CONOC}}$   
 1.41 ↓ PBN

160. *Obv.*: DVSTI... NICVPRVC  
*Rev.*: VAISVI VIARSN  $\overline{\text{OINOS}}$   
 1.43 PPC, see Reinhart, *DJN* 1940, pl. 9, 2  
 Reinhart reads the legends: DVSTINI CVPRVC ; VAISVIIVARSN ;  
 $\overline{\text{OINOS}}$ .
161. *Obv.*: DVSTI NICISIIC  
*Rev.*: VAISVI IVPSIV  $\overline{\text{CONOB}}$   
 1.43 ↓ LBM
162. *Obv.*: DNIVSTI NVSPAC  
*Rev.*: VICTOR ACVSTOR  $\overline{\text{////////ON////////}}$   
 1.73 ↑ PBN
163. *Obv.*: DNIVSTAI... INVSIPAVC  
*Rev.*: VICTOIV... AVTORAPP  $\overline{\text{CONOB}}$   
 1.45 LBM  
 Punches increase errors. Letter R in the reverse legend formed by four triangular punches: X X.
164. *Obv.*: DNVSTAI... PAVC  
*Rev.*: VITOIV VTOIVI  $\overline{\text{CONOB}}$   
 1.50 ↓ HSA 517
165. *Obv.*: DNISTAI... INVSIPAVV  
*Rev.*: VATOIV... AVTONAI  $\overline{\text{CONOO}}$   
 1.40 Formerly W. Reinhart Coll., see Reinhart, *DJN* 1940, pl. 9, 3
166. *Obv.*: DNIVSTI... IIVSPFAVC  
*Rev.*: VICTOIVII AVTORAVA  $\overline{\text{CONOB}}$   
 1.42 ↓ PBN
167. *Obv.*: DNIVSTI NASPPAVIC  
*Rev.*: VICTOAI ICVTONAVI  $\overline{\text{CONOB}}$   
 1.50 Mateu y Llopis, pl. III, 26

## GROUP JI 1a

168. *Obv.*: CV2O... TINVSP  
*Rev.*: CLORIO...  $\overline{\text{OIIOD}}$   
 1.43 ↓ PBN, Alesia Hoard

## GROUP JI 1b

169. *Obv.*: DNIVSINV · SPPAVC  
*Rev.*: VICTORIA VCVSO CON////  
 Λ in left reverse field; Λ in right reverse field  
 1.45 ↓ PBN

## GROUP JI 1c

170. *Obv.*: ///////////////VAT 2ΛV2PPAVC  
*Rev.*: ICT9ΛI /////////////// NVII CONO3  
 1.38 ↓ PBN, Gourdon Hoard  
 Last letters of reverse legend may read NVΛI for NVII.

171. *Obv.*: DIIVNVATS + VAVSPPAVC  
*Rev.*: ICTIAIA ///////////////STONVAB CONO3  
 1.41 ↓ PBN  
 Form on top of obverse head most likely a cross. Its size makes it difficult to be certain. Same die as 172.

172. *Obv.*: DIIVNVATS + VAVSPPAVC  
*Rev.*: ICTIAIA ///////////////ONVAB CONO3  
 1.45 ↓ PBN, Gourdon Hoard  
 Same die as 171.

173. *Obv.*: DIIVNVATS + VAVSPPAVC  
*Rev.*: IT2VI ///////////////VSTORVAB CONO3  
 1.44 ↓ PBN

## GROUP JI 1d

174. *Obv.*: DIIVSTI AN2PPVIC  
*Rev.*: VICTVAC Λ R R VA CONOB  
 1.47 ↓ LBM

## GROUP JI 1e

175. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORI + ΛAVCVSTV CONOB  
 1.44 ↓ PBN, Alesia Hoard

## GROUP JI if

176. *Obv.*: IINSTA IISIPAVC  
*Rev.*: IIT... AOIAITONA CONOB  
 I.45 Mateu y Llopis, pl. II, 14

## GROUP JI ig

177. *Obv.*: DVSTIA IISAIVC  
*Rev.*: VSTI ANI //////////////// IONOB  
 I.45 ↓ LBM

## GROUP JI ih

178. *Obv.*: CNIVSTI VISTIAVC  
*Rev.*: //////////////// ITRIA A VAVT IOITO  
 I.44 ↓ LBM

## GROUP JI 2

179. *Obv.*: DNIVZTN VSPPAVC  
*Rev.*: VICTORIA AVCVSTOI. CONOB  
 I.46 ↓ LBM
180. *Obv.*: DNIVSTI NVSPFAVC  
*Rev.*: VICTORIA AVCVSTORV·T· CONOB  
 Tolstoï, III, p. 252, no. 111; Lenormant 1848, pl. XI, 12  
 Last letter of reverse legend misread M by Tolstoï. Similar coin in Grierson Coll. Legends read: DNIVSTI NVSPFAVC ; VICTORA AVCVSTOAS ; CONOB.
181. *Obv.*: DNIVSTI NVSPFAVC  
*Rev.*: VICTORIA AVCVSTOR·T· CONOB  
 I.45 ↘ PBN, Alesia Hoard  
 May be same coin as 180. First described by Lenormant, then by Tolstoï.  
 Lenormant recorded it as here.
182. *Obv.*: DNIVSTIN V2PPAVC  
*Rev.*: VICTORI AAVCV2O·T· COIIOB  
 Tolstoï, III, p. 252, no. 112; Lenormant 1848, pl. XI, 10
183. *Obv.*: DII IV2IN V2PPAVC  
*Rev.*: VICTORI AVCVSTOS CONOB  
 I.44 ↓ PBN

184. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORIA ΛVCVSTORVI CONOB  
 1.40 SMM, see Reinhart, *DJN 1940*, pl. 7, 13  
 Reinhart reads the obverse legend: INIVSTINVS FFAVC.
185. *Obv.*: DNIVSTINVS PPAVI  
*Rev.*: IITORIA //////////////TAVC CINOB  
 1.40 Volkers, Reinhart, *DJN 1940*, pl. 7, 15
186. *Obv.*: DNIVSTIN V2PPAVC  
*Rev.*: VICTORIA ΛVCVSTORVA CONOB  
 1.40 Tolstoï, III, p. 252, no. 113, pl. 17
187. *Obv.*: DNIV2TI ·NVSPFAVC  
*Rev.*: VICTORIA ΛVCVSTOR·T· CONOB  
 1.40 ↓ LBM  
 Obverse legend may read ...PPAVC for ...PFAVC.
188. *Obv.*: DHIVSTI NVSPPAVC  
*Rev.*: VICTORA ΛVCVSTOA CONOB  
 1.45 ↓ LBM  
 Coin of this type in VD J, Mateu y Llopis, pl. VII, 183
189. *Obv.*: DNIVTIN PPAVC  
*Rev.*: VITON ΛCVSTO·T· COMOB  
 Star in left reverse field  
 1.45 ↓ PBN, Gourdon Hoard
190. *Obv.*: DNIVSTIN + VSPPAVC  
*Rev.*: VICTORI ΛVCV2O·T· CONOB  
 1.44 ↓ PBN, Alesia Hoard  
 End of obverse legend difficult to read. Once read PRVC.  
 Presently determined PPAVC.
191. *Obv.*: DNIVSTII + NVCPPVAC  
*Rev.*: VICTOR IΛVCVSI CONOB  
 Star in left reverse field  
 1.48 ↘ HSA 16739
192. *Obv.*: DNIVSTII + NVSPPAVI  
*Rev.*: VICTOR IΛ ////////////////IΛ CONOB  
 Star in left reverse field  
 1.45 Formerly W. Reinhart Coll., see Reinhart *DJN 1940*, pl. 7, 16  
 Reinhart did not include cross in his transcription of legend.

193. *Obv.*: DNIVSTNIV SPPAVIC  
*Rev.*: VICTORIA + AVCVSTORA CONOB  
 1.44 ↓ HSA 16742
194. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORI AIVCTOSI CONOB  
 1.48 ↓ HSA 16721
195. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTOP AAVCTOSA CONOB  
 1.44 ↓ HSA 16748
196. *Obv.*: DNIVSTI NVSPPVAC  
*Rev.*: VICTOR AVACTOS CONOB  
 1.40 Mateu y Llopis, pl. II, 20  
 Mateu y Llopis records the obverse legend: DNIV2TINV2PPVAC.
197. *Obv.*: DNIVSTI NVSPPVAC  
*Rev.*: VICTOP AVACTOS CONOB  
 1.31 ↓ PBN, Gourdon Hoard
198. *Obv.*: DNIVSIII IISPPAVC  
*Rev.*: VICTORIA AVCTSTORI CONOB  
 1.45 ↓ PBN
199. *Obv.*: DNIVSTIN NVSPPVAC  
*Rev.*: VICTORIA AVCTSTORI CONOB  
 1.43 ↓ PBN
200. *Obv.*: DNIV2T NV2PPVAC  
*Rev.*: VICTOR ACVSTOR ONOB  
 1.45 Mateu y Llopis, pl. III, 19  
 Mateu y Llopis records last half of reverse legend: ...AGVSTOR.
201. *Obv.*: DNIV2TN... N2PPVAC  
*Rev.*: VICTOI AAVCTORI ONOB  
 1.30 Lisbon, B.N., see Ennes, p. 6, no. 4  
 Ennes transcribes obverse legend: DNIVSTN...NS PP VAC.
202. *Obv.*: DNIV2T INV2PPA  
*Rev.*: VICTORIA AAVCV2 CONOB  
 1.44 ↓ HSA 16720
203. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORIA AVCVSTI CONOB  
 1.43 ↓ LBM



204. *Obv.*: DNIVST INVSPPAVC*Rev.*: VICTOR ΛΛV2 //////////////.I.

CONO///

I.44 LBM

## GROUP JI 2a

205. *Obv.*: DNIVSTIN //////////////PPAVC*Rev.*: VICTOR // + //VSSTOR

////////

+ in right obverse field

I.46 ↓ HSA 16724

## GROUP JI 2b

206. *Obv.*: DNIVSTI //////////////VSPPAVIC*Rev.*: //RIΛIV ΛCVSTORI

//////// NOB

Star in left reverse field

I.43 ↘ PBN, Alesia Hoard

## GROUP JI 3

207. *Obv.*: DNIVSTI· NVSPPAVC*Rev.*: VICTORIA ΛCVSTORVA

CONOB

I.46 ↓ HSA 16758

208. *Obv.*: DNIVSTI NVSPPAVC*Rev.*: VICTORIA ΛVCVSTORVA

CONOB

I.40 PBN, VD J, EGC, WR, see Reinhart, *DJN 1940*, pl. 7, 18  
Reinhart transcribes second S in obverse legend as X.209. *Obv.*: DNIVSTINVSPPAVC*Rev.*: VICTORIA ΛVCVSTORVA

CONOB

VQR 4995

210. *Obv.*: DNIVSTI NVSPPAVC*Rev.*: VICTORIA ΛCVSTORVA

CONOB

I.50 Mateu y Llopis, pl. III, 24

211. *Obv.*: DNIVSTI NVSPPAVC*Rev.*: VICTORIA ΛVCVSTORVA

CONOB

I.43 MAM, SAN, WR, see Reinhart, *DJN 1940*, pl. 7, 19  
Reinhart transcribes second S in obverse legend as X.212. *Obv.*: DNIVSTI NVSPPAVC*Rev.*: VICTORIA ΛCVSTORVA

CONOB

I.54 ↓ HSA 16725

213. *Obv.*: DNIVSTIN IANPPAVC  
*Rev.*: VICTORIA CVSTORVA CONOB  
 PG, ex Dumbarton Oaks
214. *Obv.*: DNIVSTIN IANSAVC  
*Rev.*: VICTORIA CVST//////// CONOB  
 1.37 Barcelona 4
215. *Obv.*: DI IIVSTI NVPPAVC  
*Rev.*: VICTORIA ////////////////// CONOB  
 Ashmoleon
216. *Obv.*: DNIVSTI VSPPAVC  
*Rev.*: VICTORIA AVCSTORVA CONOB  
 MCA, see Reinhart, *DJN 1940*, pl. 7, 17
217. *Obv.*: DNIVSTI NVSPPAVC  
*Rev.*: VICTORIA ACVSTORVA CONOB  
 1.50 Mateu y Llopis, pl. III, 23

## GROUP JI 3a

218. *Obv.*: DNIVSTI//////// N //////////SPPAV  
*Rev.*: ////////////////////////////////// CONOB  
 Star in left reverse field  
 Ashmoleon  
 Coin only studied from photographs. Reading of legend impossible.

## GROUP JI 3b

219. *Obv.*: DNIVSTINVSPPAVCC  
*Rev.*: VICTORI ////////// TORV COWOB  
 1.43 ↓ PBN, Alesia Hoard
220. *Obv.*: DNIVSTIN IVSPPAVCC  
*Rev.*: VICTORIA ACVSTORV CONOB  
 PG



## GROUP JI 4

221. *Obv.*: DI IIVIIAT AVTPPAVC  
*Rev.*: IVICTO//////// AVSTOPVA COIIO  
 1.45 ↓ PBN

222. *Obv.*:  $\text{DIIIIVIIATAVTPPAVC}$   
*Rev.*:  $\text{VICTOOIIAVVSTOIVI}$   $\overline{\text{CONOB}}$   
 1.50 ↑ HSA 16694
223. *Obv.*:  $\text{DNANASTASIVSPPAVC}$   
*Rev.*:  $\text{VICTORIA AVCVSTORVA}$   $\overline{\text{CONOB}}$   
 1.44 ↓ LBM  
 Although obverse legend reads definitely  $\text{ANASTASIVS}$ , the design is not of Anastasius period.
224. *Obv.*:  $\text{DNIVSTI NVSPPAVC}$   
*Rev.*:  $\text{VICTORIA AVCVSTORVA}$   $\overline{\text{CONOB}}$   
 1.44 ↓ HSA 16732
225. *Obv.*:  $\text{DNIVSTI NVSPPAVC}$   
*Rev.*:  $\text{VICTORIA AVCVSTORVA}$   $\overline{\text{CONOB}}$   
 1.42 ↓ PBN, Alesia Hoard
226. *Obv.*:  $\text{ΔNII2L SVSIIN}$   
*Rev.*:  $\text{IVICT CVITO}$   $\text{|||||||}$   
 1.43 ↓ PBN, Gourdon Hoard  
 Letters crudely executed and impossible to transcribe with any degree of certitude.

## GROUP JI 5

227. *Obv.*:  $\text{DNIVSTIN V2PPAVC}$   
*Rev.*:  $\text{VICTORI AVCCCA}$   $\overline{\text{CONOB}}$   
 Star in left reverse field;  $\text{R}$  in right reverse field  
 1.40 Tolstoï, III, p. 253, no. 114; Lenormant 1849, pl. I, 1, 2  
 See also Belfort, 3137, 3138.
228. *Obv.*:  $\text{DNIVSTINV SPPAVC}$   
*Rev.*:  $\text{VICTORI AVCCCA}$   $\overline{\text{CONOB}}$   
 Star in left reverse field;  $\text{R}$  in right reverse field  
 Ratto 2431, pl. LXI
229. *Obv.*:  $\text{DNIVSTI NVSPPAVC}$   
*Rev.*:  $\text{VICTORIA AVCCCV}$   $\overline{\text{COHB}}$   
 Star in left reverse field;  $\text{R}$  in right reverse field  
 Ashmoleon

230. *Obv.*: DNIVSTINVS PPAVC  
*Rev.*: NOTIVC AVCCCVΛ ONÖ  
 Star in left reverse field;  in right reverse field  
 1.30 Carles-Tolra 992, pl. 21
231. *Obv.*: DNIVSTINVS PPAVC  
*Rev.*: VICTORIA AVCCCA COMÖB  
 Star in left reverse field;  in right reverse field  
 VQR 5000  
 Given in VQR to Amalaric.

## JUSTINIAN I GROUPS

## GROUP JAN 1

232. *Obv.*: DNVIINI VIIVSPIHC  
*Rev.*: IVTOI · VOTAVI CONÖB  
 1.45 ↘ HSA 16775
233. *Obv.*: NIVSTINI ANVSIPNC  
*Rev.*: VICTORVI AIIVSTONVI CONÖ  
 1.40 MEL, PBN, see Reinhart, *DJN* 1940, pl. 9, 1
234. *Obv.*: DNIVSTINI ANVSPPAVC  
*Rev.*: VICTORI AAVCOSTI CONÖB  
 Ratto 2478, pl. LXXII
235. *Obv.*: ONVSTINI VIIVSPIII  
*Rev.*: VICTOII AVTOIAVI CONÖ  
 1.41 PBN, see Reinhart, *DJN* 1940, pl. 9, 5
236. *Obv.*: ONVSTIN VIIVPPSHC  
*Rev.*: VITOIV ///////////////VTOIAV CONÖB  
 1.21 ↓ PBN
237. *Obv.*: ONVSTIN VIIVSPHC  
*Rev.*: VICTOIV ///////////////VTOIAVI CONÖB  
 1.465 ↓ PBN
238. *Obv.*: ONVSTIN · ·VIIVSPIHC  
*Rev.*: VICTOAI · ·VTONAVI CONÖB  
 1.47 ↓ HSA 16727

239. *Obv.*: INIVSTIN //VNVSP//  
*Rev.*: VICTOI VTONAV CONOB  
 1.20 ↓ PBN
240. *Obv.*: ONVSTIN VIIVSPIVC  
*Rev.*: VICTOI VVTONAVI CONOB  
 1.50 Mateu y Llopis, pl. III, 25
241. *Obv.*: DIVIT IIVVIIIIC  
*Rev.*: IVII IITIII C·N·S  
 1.27 ↓ PBN
242. *Obv.*: DIHIT<sup>Δ</sup> HVIHIC  
*Rev.*: VICT<sup>ΔΔ</sup> ···IVII CONOS  
 1.39 ↓ HSA 16757  
<sup>Δ</sup> form in obverse legend most likely Λ. Impression caused in striking.
243. *Obv.*: DINIT· IIVINI  
*Rev.*: IVI· T· NTII C·N·  
 1.42 VD J, see Reinhart *DJN* 1940, pl. 9, 11
244. *Obv.*: NIVSTI NIANV  
*Rev.*: IOTIA IIION ONO  
 1.45 Barcelona 5
245. *Obv.*: DIHIT· NVIHIC  
*Rev.*: VICT IV·TII CONOS  
 1.39 LBM

## GROUP JAN 1a





246. *Obv.*: IIIPbIV· VNIVAN  
*Rev.*: I·NOB VV·AI ONNO  
 1.25 WR, see Reinhart, *DJN* 1940, pl. 10, 20

## GROUP JAN 2

247. *Obv.*: DNIVSI ANIVSTI  
*Rev.*: IVISOI ·IVISI· CONOS  
 1.42 ↑ HSA 503
248. *Obv.*: ONIVSTI //ANAN//  
*Rev.*: VICTORI AVCVSTII// CONOS  
 Ashmoleon

249. *Obv.*: IVIVSTI IIIIVIC  
*Rev.*: VICTOV· TOIIAVI CONOS  
 1.46 ↓ HSA 16768
250. *Obv.*: DNIVSTIN IANVSPNI  
*Rev.*: VICTORI VOTIAVI CONOS  
 1.40 PBN, MAB, see Reinhart, *DJN* 1940, pl. 9, 9
251. *Obv.*: DNIVSTINIANVSPPH  
*Rev.*: VICTOA I IOTIAVI CONOS  
 1.50 Mateu y Llopis, pl. IV, 32
252. *Obv.*: DNIVSTI NIANVSI  
*Rev.*: VICTORII IOTIAVI CONOS  
 1.15 Mateu y Llopis, pl. IV, 36
253. *Obv.*: DNIVSTINI ANVSLII  
*Rev.*: VICTOIV IVTONAVI CONOS  
 1.28 MAB, WR, see Reinhart, *DJN* 1940, pl. 9, 8  
 Transcription of legends according to Reinhart and may be erroneous since photograph is difficult to read. What can be read does not seem to follow the published transcription.
254. *Obv.*: DNIVSTI NIANVS  
*Rev.*: VICTOV IVTOIAVI CONOS  
 1.44 ↓ HSA 514
255. *Obv.*: DNIVSTI NIANVC  
*Rev.*: VICTOV VTOIAVI CONOS  
 1.43 ↓ LBM
256. *Obv.*: DNITSTIIII ANVSPN////  
*Rev.*: VICTOAI IOTIAVI CONOS  
 1.46 ↓ HSA 515
257. *Obv.*: DNIVSTI NIANVS  
*Rev.*: VICTOA I IOTIAVI CONOS  
 1.47 ↓ HSA 8117
258. *Obv.*: DNIVSTI NIANVS  
*Rev.*: VICTOAI ITOIAVI CONOS  
 1.47 ↓ HSA 511
259. *Obv.*: DNIVSTIN ANVSPAVC  
*Rev.*: VICTOAI IOTIAVI CONOS  
 1.45 ↓ PBN

260. *Obv.*: DNIVSTIN ANVSVAV  
*Rev.*: VICTOAI IIOTIAVI CONOS  
 1.43 LBM  
 Coin of this type in VD J, Mateu y Llopis, pl. VII, 187.
261. *Obv.*: DNIVSTI NI/////////  
*Rev.*: VITOAI IIIOTIAVC CONOS  
 Ashmoleon
262. *Obv.*: DNIVSTI NIANV  
*Rev.*: VIOTIA IICVSNI CONOS  
 1.44 ↓ HSA 16744
263. *Obv.*: DIVSTII INSTPPC  
*Rev.*: VICTOAI IIOTIAPP CONOS  
 1.41 ↓ LBM
264. *Obv.*: VIVATI · TIIICN  
*Rev.*: VICTAVN · IVITAI CONOS  
 1.44 ↓ PBN
265. *Obv.*: VNVATI · ISNANN  
*Rev.*: CTISIII · IVNTAIC CONOS  
 1.45 PBN, NMK, see Reinhart, *DJN* 1940, pl. 9, 15  
 Reinhart transcribes exergue letters: ONO.
266. *Obv.*: ITAVII · ITAVII  
*Rev.*: IAVII TIAIIV ONO  
 VQR 5005
267. *Obv.*: IIV V2TI NIVNV  
*Rev.*: IOTIVINIVSN ONO  
 1.34 ↘ MAM, Zorita 20  
 Cabré y Aguilo's transcription of Zorita legends unreliable and inadequate. Edits them as did Mateu y Llopis in his Madrid Catalogue.
268. *Obv.*: IIV2TI NIVNV  
*Rev.*: CTIV INCV2V ONO  
 1.38 ↓ LBM
269. *Obv.*: DIVITII · IVITIIC  
*Rev.*: IIAI ITAVII · CONOS  
 1.42 ↓ LBM
270. *Obv.*: DIVITIV · IVIT:IC  
*Rev.*: IVITV · IVI:I CONOS  
 1.43 SAN, Reinhart, *DJN* 1940, pl. 9, 14

271. *Obv.*: DIVSTI· ·NVITIC  
*Rev.*: VIIVI· I·IVI·ITI CONOS  
 RSL, Reinhart, *DJN* 1940, pl. 9, 13
272. *Obv.*: INIVSTI NIANVV  
*Rev.*: VISAV IVΛΛO ONO  
 1.41 ↘ MAM, Zorita 21  
 Cabré y Aguilo transcribes legends: INIVSTINIANVV; VISAVIVIAP.
273. *Obv.*: ITAVI ITAVII·  
*Rev.*: ATII IAVI OIIOS  
 1.33 ↓ MAM, Zorita 25
274. *Obv.*: DNITI· IVIN·C  
*Rev.*: ITIV· ·IIIOIO COIIOS  
 1.11 ↓ MAM, Zorita 24
275. *Obv.*: DNITI· IVIN·C  
*Rev.*: ·II·O· ΛVIIIIV OIIO  
 1.23 ↓ MAM, Zorita 23
276. *Obv.*: IVTI· ·IIVIIO  
*Rev.*: ITI VITI ONO  
 1.12 ↓ MAM, Zorita 22
277. *Obv.*: IVZTI VNIRCIH  
*Rev.*: IT/////////I IITIIV //// NO  
 1.41 ↓ LBM  
 Obverse transcription of letters difficult to read. Other possible readings, which depend on one's organization of the punch marks: IVZTI VNISICIH or IVZTI VNISIOH. Exact rendering of last half of legend:      
 X X X 1.

## GROUP JAN 2a

278. *Obv.*: DIVSTI· ·IIV IIIC  
*Rev.*: V·IIVIOI ·JVAOIII COIIOS  
 Ashmoleon  
 Punches used to form letters. Reading very difficult and questionable particularly in second half of reverse legend. May read: ·ITIOIII.
279. *Obv.*: DIVI.I ·IVI :I·  
*Rev.*: VITIOI ·IVI ·IV ·N·  
 VQR 5004



280. *Obv.*: DIVIT· ·IVITIVC

*Rev.*: ITOI· ·IVIOIO CONIO

1.44 ↘ HSA 16750

Last letter in reverse legend difficult to read. May be I or S.

281. *Obv.*: DIVIT· ·IVITIC

*Rev.*: ITIOI ·IVIOI CONIO

PG, ex Dumbarton Oaks

Coin of this type in VD J, Mateu y Llopis, pl. VII, 186.

282. *Obv.*: DVASTI· ·IIHAVIC

*Rev.*: VICTOTI VTOIAVI CONO

1.445 ↓ PBN

283. *Obv.*: DIVSTII IIIITPIC

*Rev.*: VICTOII IIAOVSI CONO

1.42 Barcelona 10

284. *Obv.*: IEVITI· ·TIV: IAI

*Rev.*: VICTI ΛΛVCVSI CONO

1.35 ↓ LBM

285. *Obv.*: DIVSTNI· IIVSI: PIIC

*Rev.*: VICTOAI IIOTIAVI CONIO

1.46 ↙ HSA 512

286. *Obv.*: DNIV INAN

*Rev.*: VITIOI IVIOV CONOB

1.12 Mateu y Llopis, pl. III, 27

287. *Obv.*: DNSTN ·IVSNC

*Rev.*: VICTV IINVSI CONO

1.45 ↘ LBM

#### GROUP JAN 2b

288. *Obv.*: DNIVITINI ANVSPAVC

*Rev.*: VICTRI ΛΛVSVAI CNMB

1.45 ↙ HSA 16772

289. *Obv.*: DNVSIII //SHVAV

*Rev.*: //ATIV SITIVC NO

1.25 ↓ HSA 16769

290. *Obv.*: HIV IIOAT


*Rev.*: ITI TAIC 

1.34 ↑ MAM, Zorita 26

291. *Obv.*: VI · II · IIWI

*Rev.*: ·Λ N · I · TIWI 

1.42 SAN, see Reinhart, *DJN* 1940, pl. 10, 22

As in many transcriptions of exergue form CONOB, the ONO is dominant, with initial and final letter C and reversed C becoming confused with exergue line: .

292. *Obv.*: IVIT IIVOISII

*Rev.*: VACO VIOI 

1.41 LBM

293. *Obv.*: N· ··UILSAI

*Rev.*: NO ·N 

1.38 ↓ PBN

Crudely executed coin. Rare example of upside down and reversed obverse legend.

294. *Obv.*: III ·VNI VIIAVIII

*Rev.*: IUIIVN IITIINI 

1.20 ↓ LBM

Similar coin in Grierson Coll.


295. *Obv.*: DIVTAI INTIVC

*Rev.*: VITOAI· NOTIAVIC 

Ashmoleon

#### GROUP JAN 2c

296. *Obv.*: DNIVSTI NIANVSC

*Rev.*: VITORI //////////////// 

T in left reverse field

1.45 ↓ PBN

#### GROUP JAN 2d

297. *Obv.*: DNIVSTI NIANVS

*Rev.*: VICT AIIV 

Α in right obverse field

1.39 ↓ LBM

16\*

## GROUP JAN 3

298. *Obv.*: DNIVSTINI ANVSPPAVC  
*Rev.*: VICTORI ANVCVSTORVA CONOB  
 I.47 ↓ PBN, Gourdon Hoard
299. *Obv.*: DNIVSTIN IANVSPPAVC  
*Rev.*: VICTORIA ANVCVSTORO CONOB  
 I.42 ↓ LBM  
 Two similar coins in Grierson Coll. Legends read: DNIVSTNI ANVSP-  
 PAC ; VICTORIA ANVCVSTORO CONOB ; and DNIVSTINI ANVSP-  
 PAC ; VICTORN ANVCTOROSI CONOB.  
 Both of these very similar to JI 2 coins e.g., 199 and 200.
300. *Obv.*: DNIVSTIN IANVSPPAVC  
*Rev.*: VICTOR ANVACTOR CONOB  
 I.45 ↓ LBM
301. *Obv.*: CNIVSTINI ANVSPPAVC  
*Rev.*: VICTORI ANVCVSI CONOB  
 I.45 ↓ LBM
302. *Obv.*: DNIVSTINI ANVSPPAVC  
*Rev.*: VICTORI ANVCOSTI CONOB  
 Ratto 2477, pl. LXII
303. *Obv.*: DNIVSTINI + INVSPPAVC  
*Rev.*: VICTORI ANVCVSTI CONOB  
 I.45 ↓ HSA 16726
304. *Obv.*: DNIVSTIN ANVSPPAVC  
*Rev.*: VICTORI ANVCVPI CONB  
 I.43 ↓ HSA 16730
305. *Obv.*: DNIVSTINIA + NVSPPAVC  
*Rev.*: VICTORIA ANVCVSTI CONOB  
 Mateu y Llopis, pl. IV, 29
306. *Obv.*: DIIIVSTII ANVSPPV  
*Rev.*: VICTORI ANCVSCA CON  
 I.44 ↓ HSA 516
307. *Obv.*: DNIVCTI //////////////PPA  
*Rev.*: VICTO SI////////////// CONO///  
 I.33 ↓ LBM

308. *Obv.*: DNIIIIIIISIIIIII NIANPPA  
*Rev.*: VICTVRI ΛΛVCVI CONB  
 1.43 ↓ HSA 16728
309. *Obv.*: DNIVSTN IANVSPAVC  
*Rev.*: VICTRI ΛΛVCTP CONB  
 1.08 ↓ ANS, ex Reinhart Coll.  
 Exactly like coin 994 in Carles-Tolra Coll. Reinhart transcribed CONB as CONO.
310. *Obv.*: DIVTNV· ΛI2PPA VC  
*Rev.*: VITOA IIOTIAVI CONO3  
 1.42 MEL, see Reinhart, *DJN* 1940, pl. 9, 22  
 Reinhart records this coin to be of "Blassgold."
311. *Obv.*: DNIVSTINIANVSPA VC  
*Rev.*: VICTORIA ΛCVSTOR COMOB  
 Ashmoleon
312. *Obv.*: DN IVSTINI ANVSPPA VC  
*Rev.*: VICTORIA ΛCSTORVM COMOB  
 1.55 Mateu y Llopis, pl. IV, 28

## GROUP JAN 3a

313. *Obv.*: DNIVSTINI ANIVSPPA C  
*Rev.*: VICTORIA ΛVSTORVI COMOB  
 1.29 ↓ HSA 16735
314. *Obv.*: DNIVSTINI ANVSPPA C  
*Rev.*: VICTORIA ΛVSTORVM CONOB  
 1.43 ↓ ANS, ex Reinhart Coll.

## GROUP JAN 3b

315. *Obv.*: DNIVSTI NIAIIVPC  
*Rev.*: VICTOI ACCC 2 OMI  
 1.45 ↓ LBM

## GROUP JAN 4

316. *Obv.*: DNIVSTIN ANVSAPIIC  
*Rev.*: VICTORI ΛVCTINI CNO3  
 1.43 ↓ HSA 16736

317. *Obv.*: DNIVSTINIANVSAPIIC  
*Rev.*: VICTORIA AVCTIII CNOI  
 VQR 4997  
 May be struck from same die as 316.
318. *Obv.*: DNIVSTIN ANVSAPIIC  
*Rev.*: VICTORI AVCTINI CNOO  
 1.50 Mateu y Llopis, pl. IV, 33  
 May be struck from same die as 316. As in exergue of 316, 317, inscription may read CNOI as well as CNOO.
319. *Obv.*: DNIVSTIN ANVSAPIIC  
*Rev.*: VICTORI AVCTIN CNOO  
 1.50 Mateu y Llopis, pl. IV, 34
320. *Obv.*: DNIVSTIN ANVSPPC  
*Rev.*: VICTORI AVCTIN TNO  
 1.40 Mateu y Llopis, pl. XV, 35
321. *Obv.*: DNIVSTIN ANVSPPC  
*Rev.*: VICTOPI AVCTINI COITD  
 1.41 ↓ PBN
322. *Obv.*: DNIVSTIN ANVSPPC  
*Rev.*: VICTOPI AVCTINI COITD  
 1.42 BML, PBN, MAM, WR, see Reinhart, *DJN* 1940, pl. 10, 6  
 Reinhart transcribes last half of reverse legend as: AVCTVII for AVCTINI; COITD for COITD.
323. *Obv.*: DNIVSTIN ANVSAPIIC  
*Rev.*: VICTOPI AVCTVINI COITD  
 1.45 HVK, MAM, MAB, WR, see Reinhart, *DJN* 1940, pl. 10, 7  
 Illustration of this in Reinhart article not clear enough to enable us to check Reinhart's transcription. Parts seem to suggest that legend has been mistranscribed, e.g., N in exergue seems clearly present rather than II that Reinhart recorded. Last half of reverse should read: AVCTINI; and TND.
324. *Obv.*: DNIVSTIN ANVSPPI  
*Rev.*: VICTOR AVCTIII TONO  
 1.41 VD J, see Reinhart, *DJN* 1940, pl. 10, 7  
 What has been suggested for coin 323 is unquestionably true here.  
 Reinhart transcribes legends: DNIVSTIN ANVSPPI; VICTORAVCTIII.  
 This does not tally with coin illustrated.

325. *Obv.*: ΔΙΙΙVSTIΔI ΔVSVPPC  
*Rev.*: VICTOI ΔVCTII· COIIO  
 Ashmoleon
326. *Obv.*: ΔNIVSTIN ΔNVSPPC  
*Rev.*: VICTORI ΔVCTIN .INO  
 1.39 ↓ LBM
327. *Obv.*: ΔNIVSTIΔI ΔVSVPPC  
*Rev.*: VICTORI ΔVCTIN IOIIO  
 1.45 ↓ LBM
328. *Obv.*: ΔNIVSTI ΔNVSPPI  
*Rev.*: VICOΓI VCΠIIITI .NI O  
 1.44 WR, see Reinhart, *DJN* 1940, pl. 10, 9  
 Legend of coin illustrated does not fit Reinhart's transcription: ΔIITITI-  
 ΔIIVSPPI ; VICTOORIVCIIIIITI ; CONI.
329. *Obv.*: ΔNIVSTIN ΔVSVPPC  
*Rev.*: VICTORI ΔVSTOR CONO  
 1.36 ↓ HSA 16785


## GROUP JAN 4a

330. *Obv.*: ΔNIVSTINIIINV2ΔVNC  
*Rev.*: VTΔVOII IIOΔVRRV CONO O  
 1.46 Mateu y Llopis, pl. IV, 31
331. *Obv.*: ΔNIVSTINIANVSVPPAVC  
*Rev.*: VICTONI VCATVI ONIO O  
 1.42 WLM, see Reinhart, *DJN* 1940, pl. 11, 1

## GROUP JAN 4b

332. *Obv.*: ΔNIVSTINIANVSPPAVC  
*Rev.*: VICTORI ΔVSTI OHO  
 1.35 MEL, see Reinhart, *DJN* 1940, pl. 9, 20  
 This unique coin bears a Victory figure like coins 445, 446 from Zorita Hoard (Group JII 3). If legitimate, this coin may be an intermediate step towards the type resolution seen in the "curru" group (C 1).
333. *Obv.*: ΔNIVSTINI ΔNVSPPA C  
*Rev.*: VICTORI Δ ΔVSTORVN COIIOB  
 PG

## GROUP JAN 5

334. *Obv.*: DNIVSTNI ANVSPAVC  
*Rev.*: VICTORA AV2T ON  
 1.45 Mateu y Llopis, pl. IV, 37
335. *Obv.*: DNIVSTINI ANVSPAVC  
*Rev.*: VICTOR AV2TII CON  
 1.45 SMM, see Reinhart, *DJN 1940*, pl. 9, 19  
 Reinhart records reverse: VICTORAV2TI and CONOC.
336. *Obv.*: DNIV2TIN ANV2PAV  
*Rev.*: VICTORA AV2TO CON  
 1.45 Mateu y Llopis, pl. IV, 38
337. *Obv.*: DNIVSTII ANV2PAV  
*Rev.*: VICTOR AV2TO CON  
 1.43 MAB, CRC, see Reinhart, *DJN 1940*, pl. 9, 17  
 Reinhart transcribes legends: DNIVSTINANVSAA ; VICTORAV2CIO;  
CON.
338. *Obv.*: NVSTNI ANV2PV  
*Rev.*: VICTOR ACV2TO ON  
 1.45 Mateu y Llopis, pl. IV, 39
339. *Obv.*: NVSTNI ANV2PV  
*Rev.*: VICTOR ACV2TO ON  
 1.45 Mateu y Llopis, pl. IV, 40  
 Same die as 338.
340. *Obv.*: DNIVSTNI ANVSPAC  
*Rev.*: VCTOR AV2TO COH  
 1.42 ↓ LBM  
 Letter R in reverse legend formed by arrangement of three triangular punches  Same die as 341.
341. *Obv.*: DNIVSTNI ANVSPAC  
*Rev.*: VCTOR AV2TO COH  
 1.19 ↓ PBN  
 Same die as 340.
342. *Obv.*: DNIVSTHI ANVSPAC  
*Rev.*: VICTOR AV2T OH  
 1.389 Barcelona 6  
 Amorós and Berruezo record the legend: DNIVSTHIANVSPAC ;  
 AA2TVICTOR ; OH.

343. *Obv.*:  $\overline{\text{DNIVSTN NVSPAVC}}$   
*Rev.*:  $\overline{\text{VICTOR ACVSTO}}$   
 1.40 Mateu y Llopis, pl. IV, 41
344. *Obv.*:  $\overline{\text{DNIVSTNI ANVSPAV}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTO}}$   
 1.38 ↓ HSA 16786
345. *Obv.*:  $\overline{\text{NIVSTNI ANVSPAV}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTO}}$   
 1.43 ↓ HSA 502
346. *Obv.*:  $\overline{\text{NIVSTNI ANVSPV}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTO}}$   
 1.07 ↓ MAM, Zorita 17  
 Cabré transcribes this:  $\overline{\text{HVSTINANVSPV ; VICTORAAVSTO ; ONO}}$ .
347. *Obv.*:  $\overline{\text{DNIVSTN INVSPPC}}$   
*Rev.*:  $\overline{\text{VICTORI IVAVST}}$   
 1.44 ✓ MAM, Zorita 15  
 Cabré transcribes this:  $\overline{\text{DNYSTIN INVSPPC ; VICTORIIVACV ; ONO}}$ .
348. *Obv.*:  $\overline{\text{NVSTII ANVSPAVC}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTOI}}$   
 1.19 ↓ LBM
349. *Obv.*:  $\overline{\text{DNVSTI ANVSPAC}}$   
*Rev.*:  $\overline{\text{VCTOR ANVSTOI}}$   
 0.95 ↓ HSA 510
350. *Obv.*:  $\overline{\text{DNIVSTNI ANVSI AVC}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTOI}}$   
 1.25 ↓ HSA 505
351. *Obv.*:  $\overline{\text{DNVSTNI ANVSPAC}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTOI}}$   
 1.01 ↓ HSA 506
352. *Obv.*:  $\overline{\text{DHVRTIN ANVSPAVC}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTOI}}$   
 DIC
353. *Obv.*:  $\overline{\text{DNVSTNI ANVSPAC}}$   
*Rev.*:  $\overline{\text{VICTOR ANVSTOI}}$   
 1.07 ↓ MAM, Zorita 18  
 Cabré transcribes this:  $\overline{\text{DNVST NIANVSPAC ; VICTORAVSTOI ; ONO}}$



354. *Obv.*: DNVTN NVSPVC  
*Rev.*: VCTOR ΛΛV2TOI  $\overline{\cdot N \cdot}$   
 1.15 ↓ MAM, Zorita 29  
 Cabré transcribes this: DNVTNNVSIVC ; VCTORAVSTOI ;  $\overline{OXO}$ .
355. *Obv.*: DIIIVSTIINI ANVSPAC  
*Rev.*: VITORI ΛΛVSTI  $\overline{CNNP}$   
 ↓ MAC  
 Both the obverse and the reverse bear modern notations in ink; only the number 219, written on the obverse, is distinguishable.
356. *Obv.*: DNVST VSPAVC  
*Rev.*: VITOI VVA2TI  $\overline{ONO}$   
 1.42 ↓ LBM
357. *Obv.*: DIIIVSTIINI APIVSPAC  
*Rev.*: VICTOR ΛΛV2TI  $\overline{TONOI}$   
 1.46 ↓ HSA 10619
358. *Obv.*: DNVST VSPAVC  
*Rev.*: CTOV VVA2T  $\overline{ONO}$   
 1.42 ↓ HSA 16733
359. *Obv.*: NVSTI VSPAVC  
*Rev.*: VITOV VASIA  $\overline{ONO}$   
 1.44 ↓ LBM
360. *Obv.*: DIIIV2TIINI ΛIIV2PAVC  
*Rev.*: VICTORI CIAVACI  $\overline{CONIO}$   
 1.436 Barcelona 7
361. *Obv.*: DNIVSTIN IANVSP  
*Rev.*: VICTR CVS  $\overline{ONNO}$   
 1.45 SAN, WLM, see Reinhart, *DJN* 1940, pl. 9, 16

## GROUP JAN 6

362. *Obv.*: DIVIOIA IIOIVIC  
*Rev.*: ITIVIV IIVITI  $\overline{COINIO}$   
 1.42 ↓ HSA 16780
363. *Obv.*: DIVITII IITVIC  
*Rev.*: IITVII IIVITI  $\overline{CIIIO}$   
 1.43 ↓ HSA 504
364. *Obv.*: DVITIN INTIVC  
*Rev.*: IVITII IITIV  $\overline{ONO}$   
 1.45 ↓ Mateu y Llopis, pl. V, 50

## GROUP JAN 7

365. *Obv.*: ∫IITAV· ·IIA:V·  
*Rev.*: IATIIV ITAVII       $\overline{\text{CONOJ}}$   
 1.37 ↓ HSA 16761
366. *Obv.*: ∫IITAV· ·IIA:V·  
*Rev.*: VAIIVATII       $\overline{\text{COIIIOJ}}$   
 1.39 ↓ HSA 498
367. *Obv.*: ∫IVIIIo oTIIIC  
*Rev.*: III▼o oVI       $\overline{\text{OOAO}}$   
 1.38 ↓ HSA 10618

## GROUP JAN 8

368. *Obv.*: ∫VSTII IINVUIIC  
*Rev.*: VIVSTI IANIVTI       $\overline{\text{CONOJ}}$   
 1.42 ↓ HSA 507
369. *Obv.*: IVVITV· ·I2PAVIC  
*Rev.*: VICTOI IVTONIV       $\overline{\text{CONO}}$   
 1.40 ↓ HSA 16741
370. *Obv.*: ∫IVSTII //////////////NV2PPIC  
*Rev.*: VICTOI AICVTI       $\overline{\text{CONOJ}}$   
 1.42 ↓ LBM
371. *Obv.*: ∫VIV2TV 2PAVC  
*Rev.*: VICTOI IVTONIV       $\overline{\text{CONOJ}}$   
 1.43 ↓ PBN
372. *Obv.*: ∫VISTN NV2II II  
*Rev.*: //////////////TOII ANICVTI       $\overline{\text{CONOJ}}$   
 Ashmoleon
373. *Obv.*: VITIVI· ·IVITIVT  
*Rev.*: VICTOV ITONAVI       $\overline{\text{CONOJ}}$   
 1.45 ↓ LBM
374. *Obv.*: ∫. VA2TI· ·INAVIC  
*Rev.*: VICTOTI VTOIAVI       $\overline{\text{CONOJ}}$   
 1.45 Mateu y Llopi, pl. V, 42

375. *Obv.*: DVAIT · ·VNAVIC  
*Rev.*: VICTOTI · ·IVTOΛVI CONO  
 1.41 PBN, HVK, MAM, see Reinhart, *DJN* 1940, pl. 9, 7
376. *Obv.*: IVIVSTI IIIVAVII  
*Rev.*: VICTOT · ·TONATI CONO  
 1.42 PBN, WLM, MAM, see Reinhart, *DJN* 1940, pl. 9, 6
377. *Obv.*: DNII ITVINI  
*Rev.*: VICTI · IOVNIIV CONO  
 AMI, see Reinhart, *DJN* 1940, pl. 9, 10  
 Reinhart transcribes this: HVIVITVSND ; VIVTI · IIVSNV ; CONO.
378. *Obv.*: IVSTI IIN2VI  
*Rev.*: VIOTNI II2VSNi ONO  
 VQR 5006
379. *Obv.*: VIVITVI IPAVI  
*Rev.*: VICTOIV VTONVI ONO  
 VQR 5007
380. *Obv.*: DIVITI · · IVIT · C  
*Rev.*: I2ITI · IIVITI : ☆ COIIOS  
 1.45 ↘ HSA 15979
381. *Obv.*: DVA2TI · ·INAVIC  
*Rev.*: VICOTV IVTOIΛVIC ONO  
 1.40 Mateu y Llopis, pl. V, 44  
 Legend for this coin has been confused in Madrid Coll. with legend for coin 45.
382. *Obv.*: DVITITI · · IIITIVT  
*Rev.*: VIVIVIVIVTNIVI ONO  
 1.40 Mateu y Llopis, pl. V, 45  
 Legend for this coin has been confused in Madrid Coll. with legend for coin 44.
383. *Obv.*: DVIT2VI IVIΛVIC  
*Rev.*: IVTOΛI ΛIOIIV OIIO  
 1.437 Barcelona 13  
 Amorós and Berruezo record legend: IVIT2VIIIVACVC ; IVTOΛIIOI · IVOIIO ; OIIO.
384. *Obv.*: DVRVVIVVIRVC  
*Rev.*: VRVOI VTRVOR ONO  
 1.45 Mateu y Llopis, pl. V, 46

385. *Obv.*: ∫·VIAIVVATRVC  
*Rev.*: VIRVVIVIOVI  $\overline{\text{ONO}}$   
 1.45 Mateu y Llopis, pl. V, 47

386. *Obv.*: ∫·VINIOIITSIVC  
*Rev.*: VCTIOIVT∫V  $\overline{\text{ONO}}$   
 1.45 Mateu y Llopis, pl. V, 43

## GROUP JAN 8a

387. *Obv.*: ·IIV IIIAIAI  
*Rev.*: VI·III·III  $\overline{\text{CON·}}$   
 1.43 WR, see Reinhart, *DJN* 1940, pl. 10, 19  
 Reinhart transcription may not be correct. Poor photograph does not permit complete reading.

388. *Obv.*: AIVI·IVI:I·  
*Rev.*: VI·IV·☆☆I☆☆  $\overline{\text{C·N·}}$   
 VQR 5003

389. *Obv.*: IIVSII·IISVII  
*Rev.*: VIA IV VIAIV  $\overline{\text{ONO}}$   
 1.25 WR, see Reinhart, *DJN* 1940, pl. 10, 18

## GROUP JAN 8b

390. *Obv.*: TV IIA ▲▲ IAIII  
*Rev.*: II II IIII  $\overline{\text{·N·}}$   
 1.41 ↓ PBN  
 Extremely rare occurrence in Visigothic coinage observed in this coin with obverse portrait facing left. Suggests a non-Visigothic attribution.

## GROUP JAN 9

391. *Obv.*: DNIVSTINIA NVSPPAVC  
*Rev.*: VICTORI AACSTI  $\overline{\text{CIIAON}}$   
 1.435 ✓ PBN, Alesia Hoard

392. *Obv.*: CIVSI///// /////NINNO  
*Rev.*: VICT V///// /////IAN  $\overline{\text{////OHO∫}}$   
 1.43 ↘ HSA 518  
 Same die as PBN, coin 393.

393. *Obv.*: CIVSTI///// /////NINNO*Rev.*: VICT //////////////RIAN

////OVOO//

r.44 ↓ PBN, Gourdon Hoard

## GROUP JAN 10

394. *Obv.*: DN VSINIANV2PPAC*Rev.*: ΛΙΟΤV· INROTCI

CONO

r.45 Mateu y Llopis, pl. IV, 30

Most likely same die as 395, even though there is a difference in reading of legend. May be a mistranscription by Mateu y Llopis, photograph too poor to be checked. Unique Victoria advances to left.

395. *Obv.*: DNVSIIA NV2PPAC*Rev.*: ΛΙΟΤVOO INROTCI


CONO

r.52 ↓ HSA 16778

## GROUP JAN 11

396. *Obv.*: DNIVSTIN IANVSPPAQI*Rev.*: VICTORIA + ACCCV

CONOB


Star in left reverse field,  in right reverse field.

r.46 ↓ HSA 16712

Coins in JAN 11 and subsidiary groups sometimes present a Victory without a palm branch; accounted for by space taken up by monogram in right reverse field, which necessitates deletion of bottom extension of palm branch; also by confusing upper half of branch with legend, where it is still to be recognized in this particular coin but where it is in other examples either deleted completely or turned into the letter I. Cf. Belfort, *Monnaies Mérovingiennes*, nos. 5492, 5493, 5475-5488, 5881-5883, 2293; and Prou, *Monnaies Mérovingiennes*, p. 10, 38 (pl. I, 14), p. 12, 48 (pl. I, 17), p. 9, 34 (pl. I, 10).

397. *Obv.*: DNIVSTNIANVSPPAVC*Rev.*: VICTOR IΛCCCA


COMOB

Star in left reverse field,  in right reverse field

r.30 Tolstoï, IV, p. 383, no. 542, pl. 27

398. *Obv.*: DNIVSTINIANVSPPAQV*Rev.*: VICTORI Λ+ACCCV


COMOB

Star in left reverse field,  in right reverse field

r.35 Tolstoï, IV, p. 383, no. 541, pl. 27

399. *Obv.*: DNIVSTINIANVSCC

*Rev.*: VICTOR ΛΛ/////OZTCC C O I O

Star in left reverse field,  in right reverse field

1.36 ↓ HSA 16755

400. *Obv.*: DNIVSTINI ANVSPACV

*Rev.*: VICTORIA + Λ·VSTORVM C O I I O B

Letters in the reverse field too worn to be legible

1.50 ↓ Copenhagen, Voldstedet Hoard

Coin found in 1880 in Voldstedet (Zeeland). See *Nordisk Numismatisk Aarsskrift* (1946). This coin was brought to my attention by Miss Joan Fagerlie of the ANS.

#### GROUP JAN 11a

401. *Obv.*: DNIVSTINIANVSPAC

*Rev.*: VICTORI + ΛΛVCCC C O N O B

☿ in left reverse field, star in right reverse field

Tolstoï, IV, p. 384, no. 544; Lenormant 1849, pl. I, 10

Cf. 396. The Victory bears no palm branch.

402. *Obv.*: DNIVSTINIANVSPACV

*Rev.*: VICTOR + ΛΛVCCC C N O B

☿ in left reverse field, star in right reverse field

Tolstoï, IV, p. 384, no. 545; Lenormant 1854, pl. XI, 11

Cf. 396. The Victory bears no palm branch.

#### GROUP JAN 11b

403. *Obv.*: DNIVSTIANVSPAC

*Rev.*: VICTORIN + ATTON C O I O

Tolstoï, IV, p. 385, no. 546; Lenormant 1854, pl. XI, 3

Cf. 396. The Victory bears no palm branch. It is to be noted that, in this group that bears letters or stars in the reverse field instead of stars and a monogram, the lack of the palm branch is still maintained.

404. *Obv.*: DHIVSTIANIANVSPACV

*Rev.*: VICTORIA + ΛCVSTORVM C O N O B

Tolstoï, IV, p. 384, no. 543; Lenormant 1849, pl. I, 7

405. *Obv.*: NIVSTIAN VSPPV

*Rev.*: VICTORIA· + ΛCV~TOVV O M O B

Tolstoï, IV, p. 385, no. 547; Lenormant 1854, pl. XI, 4

Cf. 396, 403. The Victory bears no palm branch.

406. *Obv.*: ΔΙΙΥΣΤΑΙ + ΛΥΝΣΡΡΑΥC

*Rev.*: VICTORIA ΛΥCCCV

1.43 ↓ PBN, Gourdon Hoard



#### GROUP JAN IIC

407. *Obv.*: ΝΙΥΣΤΝ ΛΝΥΣΙΥ

*Rev.*: WCTORIΥΥΙΥ ~ ΟΥΥΝ

CONOB

K in right reverse field

1.46 ↓ ANS, ex Reinhart Coll.

Cf. 396, 403. The Victory bears no palm branch.

#### JUSTIN II GROUPS

##### GROUP JII 1

408. *Obv.*: ΔΝΙΥΣΤΝ ΝΣΡΡΑΥC

*Rev.*: VITOR ΛΛΥΣΤΟΙ



1.37 ↓ HSA 16729

409. *Obv.*: ΔΝΙΥΣΤΙ ΝΣΡΡΑΥC

*Rev.*: VITOR ΛΛΥΣΤΟΙ

CONIO

1.22 ↓ LBM

410. *Obv.*: ΔΝ Υ2 ΙΙΝΥΑΥC

*Rev.*: ΙΥΙΡ ΙΟΝΟΥ



1.45 Mateu y Llopis, pl. VI, 53

##### GROUP JII 2

411. *Obv.*: ΔΝΙΥΣΤΙ ΝΥΣΡΑΥC

*Rev.*: VICTOR ΛΛΥΣΤΟ

ONII

1.08 VDJ, see Reinhart, *DJN* 1940, pl. 9, 28

412. *Obv.*: ΔΝΥΣΤΙΙ ΙΥΣΡΑΥC

*Rev.*: VICTOR ΛΛΥΣΤΙ

ONO

1.20 ↓ MAM, Zorita 37

Cabré transcribes this: ΔΝΥΣΤΙΙΙΥΣΡΑΥC ; VICTORIAAΥΣΤΙ ; ONO

413. *Obv.*: ΔΝΥΣΤ ·· ΥΣΡΑΥC

*Rev.*: CTOΥ ΥΥΛ2Τ

ONO

1.11 ✓ MAM, Zorita 31

Cabré transcribes this: ΔΝΥΣΤΥΣΡΑΥC ; CTOΥΥΥΑΣΤ.

- 17



423. *Obv.*: OVV ΛΛV2TI

*Rev.*: ΛΛ2· NIV2I·T 

o.86 ↑ MAM, Zorita 44

Cabré transcribes this: OVVAADVSTI ; A·A·I·NI VSI·T·.

424. *Obv.*: Λ2ITTI ΛHNIC

*Rev.*: VICTOI VIVCIII 

1.10 ↓ MAM, Zorita 48

Cabré transcribes this: ASITTAHNIC.

425. *Obv.*: ɔVIITI IVISΛII·

*Rev.*: VICTO ΛTISVI 

1.14 ↓ MAM, Zorita 41

426. ɔVIITI IVISΛII·

*Rev.*: VICTOR VΛASVOI 

1.10 ↘ MAM, Zorita 40

427. *Obv.*: ɔPSIT VASIIV

*Rev.*: ΛTNV VIVN 

1.19 ↙ MAM, Zorita 49

428. *Obv.*: ɔVVNΓ NSVNC

*Rev.*: VCTOΛ VΛɔV 

1.47 ↓ MAM, Zorita 47

Cabré transcribes this: DVVNANSVAC ; VCTCIOVACV.

He states further that it is of poor quality gold. May read in obverse: VCTOC for VCTOΛ.

429. *Obv.*: IVSTIIVICɔ

*Rev.*: VICTOΛ TIVSTVNI

1.31 ↙ MAM, Zorita 32

Cabré transcribes last three letters of reverse legend as part of exergue, however, this unique coin has no exergue region; these letters are actually part of reverse legend.

430. *Obv.*: ɔIVATIII · IIIITPC

*Rev.*: IITD ΛAT 




1.10 ↙ MAM, Zorita 51

431. *Obv.*: V2TI VPISC




*Rev.*: VICT VVNI 

1.44 ↓ MAM, Zorita 46




Cabré states that this coin is of poor quality gold.

432. *Obv.*: CNSTΛ · ΛONCQI  
*Rev.*: VVΩNS VVITC   
 1.44 ✓ MAM, Zorita 50
433. *Obv.*: ΩΛIIIVI VTIVC  
*Rev.*: ΛII II ΛT   
 1.38 ↓ MAM, Zorita 43
434. ΩIVIII VTIIIC  
*Rev.*: IIII IIIIII   
 1.374 Barcelona 18

## GROUP JII 2a

435. *Obv.*: ΞSVΛIVI ΛTSIΛIV  
*Rev.*: OTΩVΛ OITΩIV   
 1.11 ✓ MAM, Zorita 9  
 Both obverse portrait bust and Victoria on reverse face to left. This rare coin has not only reversed direction of the types, but legends have likewise been reversed. Put in correct order they should read: VIALΩTA IVIΛVΩN ; VICTIO ΛVSTO.
436. *Obv.*: IIIVII IISQVΛΩ  
*Rev.*: NOΛOI ITIVI   
 1.24 ✓ MAM, Zorita 12  
 Victoria on reverse faces to the left.
437. *Obv.*: ·VΛTIV· ·IIILLI :  
*Rev.*: VLIVV V·LIVΛ   
 1.45 ↑ MAM, Zorita 45

## GROUP JII 2b

438. *Obv.*: ΩNSTΩV VNΩTC  
*Rev.*: VANΩT CNTOYC   
 1.47 ↓ MAM, Zorita 11  
 Victoria on reverse faces left.
439. *Obv.*: VNΩ VVIO  
*Rev.*: VIV VVIA   
 1.48 ✓ MAM, Zorita 10
440. *Obv.*: VQPIHIIII INIIIVΛ  
*Rev.*: IΛΩ AVASIA   
 1.40 ↓ MAM, Zorita 8  
 Both obverse portrait bust and Victoria on reverse face to left.

17\*

## GROUP JII 3

441. *Obv.*: ДИВ2V + VPΛVHC*Rev.*: VICCTO VΛC  $\overline{\text{ONO}}$ 

1.46 ↓ MAM, Zorita 16

Cabré transcribes obverse: DNVSVVSAVVIC.

This he informs us is of poor gold. In none of the following Zorita specimens does Cabré transcribe the cross in obverse legend, e.g., 442, 443, 444.

442. *Obv.*: ДИВ2V + VPΛVHC*Rev.*: ДVICTO · VΛC  $\overline{\text{ONO}}$ 

1.50 ↑ MAM, Zorita 53

This Cabré informs us is of poor gold. Although very blurred the exergue does read: ONO.

443. *Obv.*: ДИVSV + VPΛVHC*Rev.*: VICTOVΛC  $\overline{\text{ONO}}$ 

1.36 ↓ MAM, Zorita 54

This Cabré informs us is of poor gold. Cross in obverse legend slightly blurred and difficult to read exactly, but, since this coin follows so closely dies of 441, 442, we suggest the original presence of it.

444. *Obv.*: ДИВ2V + VPΛVHC*Rev.*: VICTO VΛC  $\overline{\text{O}////\text{C}}$ 

1.18 ↓ MAM, Zorita 54

This Cabré informs us is of poor gold.

445. *Obv.*: DNIVΛ OΛSVPC*Rev.*: VICTO VΛVCI  $\overline{\text{CONO}}$ 

1.48 ↓ MAM, Zorita 62

This Cabré informs us is of poor gold. Cabré transcribes legends: DNIVAVVASVPC ; VICTOVΛVC. The P in obverse legend looks like a D.

446. *Obv.*: DNIVΛ///// OΛSVDC*Rev.*: VICTO VΛVCI  $\overline{\text{CONO}}$ 

1.55 ↓ MAM, Zorita 63

May be from same die as 445.

447. *Obv.*: ДИVIT OΛSVPC*Rev.*: VICTO · VΛVC  $\overline{\text{CONO}}$ 

1.43 ↓ MAM, Zorita 64

This Cabré informs us is of poor gold. Cross in obverse legend of other coins in this group is here presented as T.

448. *Obv.*: ДИVSTINVSPAC*Rev.*: VICTORIA ΛVCN  $\overline{\text{CONOB}}$ 

1.37 Mateu y Llopi, pl. VI, 56

449. *Obv.*: ḐNIVSTNI NVSPΛVC  
*Rev.*: VICTOR ΛΛVS·I· CNOB  
 1.04 ↓ MAM, Zorita 13  
 Cabré refers to this as being composed of "oro de ley."
450. *Obv.*: ḐNIV2TIN V2PPΛVC  
*Rev.*: VICTOR IΛΛVC·I· CONOB  
 1.30 MAB, WR, see Reinhart, *DJN 1940*, pl. 9, 29  
 Similar to coin 997 of Carles-Tolra Coll. Reinhart transcribes it:  
 ḐNIVSTINVSPPAVC ; VICTORIAΛCV.
451. *Obv.*: ḐNIV2TIN V2PPΛVC  
*Rev.*: ·I·VΛΛIЯ ΛIVTḐIV CONO3  
 1.09 MAM, WR, see Reinhart, *DJN 1940*, pl. 9, 30  
 Similar to 996 of Carles-Tolras Coll. Reverse legend is inscribed backwards.
452. *Obv.*: ḐNIVSTI NVSPPAVC  
*Rev.*: VICTORI ΛΛVCO CONO  
 Ashmoleon
453. *Obv.*: ḐMV2VIN V2PPΛVC  
*Rev.*: ·I·VΛΛIR ΛIVTḐIV CONOB  
 1.09 ↓ ANS, ex Reinhart Coll.  
 Obverse legend should read: ḐNIV2TIN. Reading of V for T in Justinus may be due to the quality of the wearing. This is from the Carles-Tolra Coll., 996.
454. *Obv.*: ḐNVSTNV INVSPΛVC  
*Rev.*: VICTORI T ICV2TC CONOB  
 1.46 ↓ MAM, Zorita 14  
 Cabré refers to this as being composed of "oro de ley."
455. *Obv.*: ḐVVSΙ ITSVIIC  
*Rev.*: IVVbDI IDVVbb COII  
 AMS, see Reinhart, *DJN 1940*, pl. 9, 26
456. *Obv.*: ḐNVT V99VC  
*Rev.*: VSND IVT9VI CTI3  
 1.50 SAN, see Reinhart, *DJN 1940*, pl. 9, 25  
 D in reverse legend is read by Reinhart Λ.
457. *Obv.*: ḐN ISVA ΛV2ΛVPC  
*Rev.*: VICTO VΛḐV ONO  
 1.49 ↓ MAM, Zorita 60

458. *Obv.*: DN V2VC TNVPAVC

*Rev.*: VICTOVAV

DNOS

1.50 ↓ MAM, Zorita 52

459. *Obv.*: DN IVST VVPPVC

*Rev.*: VICTO//////// IVAVO

CON

1.43 ✓ MAM, Zorita 36

Cabré informs us that this is composed of "oro muy bajo."

460. *Obv.*: DNISVA AVSAVPC

*Rev.*: VAVNO IVNPVTI

ONNO

1.49 ↓ MAM, Zorita 59

This Cabré informs us is of poor gold.

461. *Obv.*: DNIV2TI VNV299C

*Rev.*: VICTORI VAVCV

CONO

1.46 ↑ MAM, Zorita 34

This Cabré informs us is of poor gold and transcribes legends: DNIVST-IVNVSPPC ; VICTORIIVAVCV ; NO. He includes the top half of palm branch as repeated I of reverse legend.

462. *Obv.*: DNIV2TI NVV299C

*Rev.*: VICTOR IIAVCOV

1.41 ↓ MAM, Zorita 33

This Cabré informs us is of poor gold and transcribes second C in reverse legend as T.

463. *Obv.*: DN IVST VVPPVC

*Rev.*: IVCTO ONPV

ION

1.40 ↓ MAM, Zorita 35

This Cabré informs us is of poor gold. Transcribes legends: DNIVSTVPAVC ; IVPTOONSV.

464. *Obv.*: DNIVSTINIANVSPPAVC

*Rev.*: TVOVIAI AOTIV

ONNO

Star in right reverse field

1.44 SAN, see Reinhart, *DJN* 1940, pl. 9, 18

465. *Obv.*: DNIVSTINV2 PAVC

*Rev.*: VICTO NVASBR

ONO

1.24 Mateu y Llopis, pl. VI, 54

Photograph so poor that it is questionable whether or not this coin can be considered. Generally seems to connect with this group.

## GROUP JII 3a

466. *Obv.*:  $\overline{\text{DNIVAI}} \overline{\text{AVAPPA}} \star$   
*Rev.*: VICT  $\text{//////////}\overline{\text{AVIAVI}}$   $\overline{\text{CONOI}}$   
 1.51 ↓ MAM, Zorita 61  
 This Cabré informs us is of poor gold.
467. *Obv.*:  $\overline{\text{DNIVIV}} \overline{\text{VPPAC}}$   
*Rev.*: VICTO  $\star \overline{\text{AVCC}}$   $\overline{\text{CONOB}}$   
 1.53 ↑ MAM, Zorita 65  
 This Cabré informs us is of poor gold.
468. *Obv.*:  $\star \overline{\text{DNIAVIVIOIAVI}}$   
*Rev.*:  $\text{IIO//////////}\overline{\text{VIV}}$   $\overline{\text{OIO}}$   
 1.37 ↙ MAM, Zorita 58  
 This Cabré informs us is of poor gold.
469. *Obv.*:  $\star \overline{\text{DNIAVIVIOIAVI}}$   
*Rev.*: VICVIO  $\overline{\text{IAVICI}}$   $\overline{\text{CONO}}$   
 1.50 ↓ MAM, Zorita 57  
 This Cabré informs us is of poor gold.
470. *Obv.*:  $\overline{\text{DNIAIOIAVPPAVC}}$   
*Rev.*: VICVIO  $\overline{\text{IAVICI}}$   $\overline{\text{CONO}}$   
 1.35 ↓ MAM, Zorita 56  
 This Cabré informs us is of poor gold.
471. *Obv.*:  $\overline{\text{DNIVIV}} \overline{\text{VIAVPPAI}}$   
*Rev.*: VICTO R  $\overline{\text{IAVIC}}$   $\overline{\text{CONOB}}$   
 1.48 ↓ MAM, Zorita 66  
 This Cabré informs us is of poor gold.
472. *Obv.*:  $\overline{\text{DN}} \overline{\text{IVIIVIAPPAC}}$   
*Rev.*: VICTO  $\overline{\text{RIAVAC}}$   $\overline{\text{CONOB}}$   
 1.40 ↓ MAM, Zorita 67
473. *Obv.*:  $\overline{\text{DIVV2ITV}} \text{//////////} \overline{\text{IVPAIVC}}$   
*Rev.*: CTIOA ·  $\overline{\text{IVIAC}}$   $\text{//////////}$   
 1.50 ↙ MAM, Zorita 72  
 This Cabré informs us is of poor gold.
474. *Obv.*:  $\overline{\text{LIVVIGI}} \overline{\text{AIREXPP}}$   
*Rev.*:  $\overline{\text{LIVVIGIL}} \overline{\text{AIREXN}}$   $\overline{\text{OIOIO}}$   
 1.51 ↙ MAM, Zorita 83  
 Letter transcribed here as second P in obverse legend is transcribed S by Cabré. It is more exactly ↗.

475. *Obv.*: ∫NTSNV IVNSTC*Rev.*: ILIVVIC ICVSI       $\overline{\text{ICOI}}$ 

I.44 ↓ MAM, Zorita 82

476. *Obv.*: ∫ITSNTV VNTSPVC*Rev.*: IV∫IDCO VNOVI       $\overline{\text{ONIO}}$ 

I.47 ↑ MAM, Zorita 39

This Cabré informs us is of poor gold. Cabré included the wreath held by the Victory as an O in the reverse legend.

477. *Obv.*: ICLIVVIC LOIEECIS*Rev.*: IVLIVVIC IVVCVSI       $\overline{\text{ICOI}}$ 

I.45 ↓ MAM, Zorita 81

## GROUP JII 4

478. *Obv.*: VICTVI SIA ·PII*Rev.*: VICTVP IAI2IV       $\overline{\text{CONO}}$ I.43 PPC, see Reinhart, *DJN* 1940, pl. 10, 10

Reinhart transcribes obverse legend: VICTVINIA·2II.

479. *Obv.*: IVIVIVIVIVIVIV*Rev.*: IVIVIVIVIVIVIV       $\overline{\text{CONO}}$ 

I.40 ↓ HSA 499

480. *Obv.*: ΓVNINVNINVVRC*Rev.*: IVNVNVNVNVNVVI       $\overline{\text{CONO}}$ 

I.45 Mateu y Llopis, pl. V, 52

481. *Obv.*: IVIVIVIVIVIVIVIVIV*Rev.*: IVIVIVIVIVIVIV       $\overline{\text{CONO}}$ 







I.49 ↓ MAM, Zorita 87

482. *Obv.*: IVNVIIIIVNVN*Rev.*: IVIIIAIIVNVI       $\overline{\text{CON}}$ CCL, see Reinhart, *DJN* 1940, pl. 10, 11Reinhart transcribes letters in exergue:  $\overline{\text{TON}}$ .483. *Obv.*: IVNIVIIIIVIVNII*Rev.*: IVNVIIIVIIIIVII       $\overline{\text{CONO}}$ I.38 WR, see Reinhart, *DJN* 1940, pl. 10, 12

484. *Obv.*: IVIVIVIVIVIVIVIV  
*Rev.*: IVIVIVIVIVIVIV  $\overline{CVVII}$   
 PG, ex RSL, see Reinhart, *DJN* 1940, pl. 9, 13
485. *Obv.*: IVVVIIIIVIIIIVVIII  
*Rev.*: IVS //////////////// IVNIVN  $\overline{IOIIIO}$   
 1.42 ↓ LBM
486. *Obv.*: DN LIVVIQILDVSREX  
*Rev.*: DN LIVVIQILΔVSREX  $\overline{A\overline{DD}}$   
 1.34 ↓ HSA 15590, Miles 7e, pl. 1, 6
487. *Obv.*: DN LIVVIQILDVSREX  
*Rev.*: DN LIVVICILDVSREX  $\overline{A\overline{DD}}$   
 1.28 ↓ LBM
488. *Obv.*: DN LIVVIGILDVSRE  
*Rev.*: DN LIVVICILDVSREX  $\overline{ON\overline{O}}$   
 1.45 Mateu y Llopis, pl. VII, 65
489. *Obv.*: DN LIVVIGILDV2REX  
*Rev.*: DN LIVVIGILDVS  $\overline{CON}$   
 1.32 Mateu y Llopis, pl. VII, 66
490. *Obv.*: DN LIVVIGILDVSRE  
*Rev.*: DN LIVVIGILDVSREX  $\overline{ON\overline{O}}$   
 1.20 Mateu y Llopis, pl. VII, 67
491. *Obv.*: DN IVIVGILV  
*Rev.*: IA IVNIS  $\overline{ON\overline{O}}$   
 1.28 Mateu y Llopis, pl. VII, 68
492. *Obv.*: DN LIVVIQILDVSREX  
*Rev.*: DN LIVVIQILDVSREX  $\overline{ON\overline{O}}$   
 See Reinhart, *DJN* 1940, pl. 10, 15  
 Coin of this type in VD J, Mateu y Llopis, pl. I, 6.
493. *Obv.*: DN LIVVIQILDVSREX  
*Rev.*: DN LIVVIQILDVSRE  $\overline{X}$   
 See Reinhart, *DJN* 1940, pl. 10, 16  
 Last letter of reverse legend X is in exergue.
494. *Obv.*: DN LIVVIQILDVSREX  
*Rev.*: DN LIVVIQILDVSREX  $\overline{A\overline{DD}}$   
 MAM, see Reinhart, *DJN* 1940, pl. 10, 17





## GROUP JII 4a

495. *Obv.*: //IIIIIIIIIIIV IIIIIIIII  
*Rev.*: IVIII III IVIVII   
 I.15 ↓ HSA 519
496. *Obv.*: IVZTIIII VIIIIZIIII  
*Rev.*: IVIII IIVIVIIIVII   
 VQR 5008
497. *Obv.*: IVIIIV IIV IIV IIV IIV  
*Rev.*: IVIIVI IIIV IIVIC   
 I.25 ↓ MAM, Zorita 86
498. *Obv.*: II VIIIIIVΛIIVIIIV  
*Rev.*: IV INVITIIII   
 I.24 ↓ ANS, ex Reinhart Coll.
499. *Obv.*: IIITIAI· IATIC  
*Rev.*: ITVI IIVITI   
 I.203 Barcelona 19
500. *Obv.*: INC TVΛANTO  
*Rev.*: IAD IVN   
 I.09 ✓ MAM, Zorita 74  
 Cabré reads reverse legend: IAIICIIIV. If transposed exactly this would be: IAIICIIIV. The IΔ combination is so close that here it is interpreted D and the final IV as N. This interpretation is encouraged by the fact that all of the other letters on this coin are very widely spaced. Reading D and N would keep them in style with rest of the coin.

## GROUP JII 4b

501. *Obv.*: VVIDOVZREX  
*Rev.*: LVVVVIVSREX   
 I.20 HVP, see Reinhart, *DJN* 1940, pl. 10, 14

## GROUP JII 5

502. *Obv.*: IIIVZTI IIIAVAC  
*Rev.*: VIOTVA ITOZVΛO   
 I.51 ↓ HSA 16665
503. *Obv.*: IIIVZTI IIIAVAC  
*Rev.*: VIOTVA ITOZVΛO   
 I.47 ↓ PG, ex ANS, ex Reinhart Coll.

504. *Obv.*:  $\overline{\text{DIIIIVZT}} \text{ III IIIAVAC}$   
*Rev.*:  $\text{VICTVA ITO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.45 ENP, MAM, MAB, see Reinhart, *DJN* 1940, pl. 10, 3  
 Last letter in reverse legend a unique form found only in coins of this group  $\Theta$  or  $\bigcirc$ . Reinhart has interpreted it B and connects it with CONOB of exergue. Barcelona no. 11 item weighs 1.463 gms., legends read:  $\overline{\text{DIIIIVZT}} \text{ III IIIAVAC}$  ;  $\text{VICTVA IT } \overline{\text{RV}\Lambda\Theta}$  ;  $\overline{\text{COII}\Theta}$ .
505. *Obv.*:  $\overline{\text{DNIVZTIN}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VICTAA} \cdot \text{TO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.20 Mateu y Llopi, pl. VI, 61  
 Photograph of this coin suggests corresponding treatment of final O in the reverse legend as in 504. This and the unique treatment of R common to this group are ignored by Mateu y Llopi who transcribes legend:  $\text{VICTAATOOVAO}$ .
506. *Obv.*:  $\overline{\text{DNIVSTIN}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VICTAA} \text{ TO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.29 Mateu y Llopi, pl. VI, 62
507. *Obv.*:  $\overline{\text{DNIVZTI}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VCOITO } \overline{\text{RV}\Lambda} \quad \overline{\text{ONO}}$   
 0.94 Mateu y Llopi, pl. VI, 63
508. *Obv.*:  $\overline{\text{DNIVZT}} \text{ // // // // // // // //}$   
*Rev.*:  $\text{// // // // // // // //} \text{ TO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.23 ↓ PBN
509. *Obv.*:  $\overline{\text{DIIIIVZTII}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VICTVA} \text{ TO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.45 VD J, AMS, WR, MAM, see Reinhart, *DJN* 1940, pl. 10, 1  
 $\bigcirc$  in reverse legend has this time been transcribed O and kept out of the exergue legend. Two more like this in VD J, Mateu y Llopi, pl. VII, 192-193.
510. *Obv.*:  $\overline{\text{DIIIIVZTI}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VICTVA} \cdot \text{ITO} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.45 AMS, MAM, MAB, WR, see Reinhart, *DJN* 1940, pl. 10, 2  
 See 503. Reinhart again transcribes exergue CONOB. Barcelona item no. 12 weighs 1.496 gms., legends read:  $\overline{\text{DIIIIVZTII}} \text{ IIIAVAC}$  ;  $\text{VICTVA TO} \overline{\text{RV}\Lambda\Theta}$  ;  $\overline{\text{COII}\Theta}$ .
511. *Obv.*:  $\overline{\text{DNIASTI}} \text{ IIIAVAC}$   
*Rev.*:  $\text{VICTVA} \text{ O} \overline{\text{RV}\Lambda\Theta} \quad \overline{\text{CONO}}$   
 1.20 Mateu y Llopi, pl. VI, 57  
 Mateu y Llopi transcribes reverse:  $\text{VICTVAOOVAO}$ .  $\overline{\text{CON}}$  for  $\overline{\text{CONO}}$ .

512. *Obv.*: DNIASTI IIIAVAC  
*Rev.*: VICTVA OVAO CONOB  
 1.47 Mateu Llopi, pl. VI, 58  
 Photograph too poor to edit Mateu y Llopi's transcription. One possible error noted in second part of reverse legend where it is possible to read VV for VA.
513. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VIOVA TOXVAO CONO  
 1.50 Mateu y Llopi, pl. VI, 59  
 Mateu y Llopi transcription: VIOVATOOVAO ; ONO.
514. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VICTVA TOXVRO CONO  
 1.60 Mateu y Llopi, pl. VI, 60
515. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VICTVV TOXVAO CONO  
 Ashmoleon
516. *Obv.*: DNIVSTI IIIVAC  
*Rev.*: VIOVA TOXVAO CONO  
 1.19 ↘ HSA 500
517. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VICTVA TOXVAO CONO  
 2.020 ↑ PBN  
 Most likely false. Victory figure is not in keeping with any of the other coins in this group. Execution of palm branch and wings very suspicious.
518. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VLLIVVI QILDIREGIS  
 1.30 HVP, MAM, see Reinhart, *DJN 1940*, pl. 10, 4; Heiss, pl. I, 1  
 Reverse legend continues into area of exergue. Similar coin is Lonja del Almidón no. 690 (pl. 12).
519. *Obv.*: DNIVSTI IIIAVAC  
*Rev.*: VCLIVVIQILDIREGIS  
 AMS, see Reinhart, *DJN 1940*, pl. 10, 5
520. *Obv.*: DNIVSTI IIIAVA  
*Rev.*: VICTVA TOXVAO CONO  
 1.50 Carles-Tolra 999, pl. 21
521. *Obv.*: DNIVST IIIAVA  
*Rev.*: C LIVVIQILDIREGIS  
 Mateu y Llopi, pl. VII, 64

522. *Obv.*: IIIVSTI IIIΛVΛ  
*Rev.*: VIΩVΛ TOϢVΛO  $\overline{\text{CONO}}$   
 VQR 5009
523. *Obv.*: IIIVΣTI II IIIΛVΛ  
*Rev.*: VIΩTVΛ ITORVΛO  $\overline{\text{CONO}}$   
 VQR 5010
524. *Obv.*: DN IVSTIIIIΛVΛC  
*Rev.*: CLIVVIGILDIREGIS  
 Heiss, p. 81, pl. I; Florez, p. 169

## GROUP JII 5a

525. *Obv.*: ΩVRT ϢΛIVYϢITΛVϢVC  
*Rev.*: VRRTA IIOVϢV  $\overline{\text{COIO}}$   
 JH

## GROUP JII 5b

526. *Obv.*: (Too blurred to be intelligible)  
*Rev.*: (Too blurred to be intelligible)  $\overline{\text{OIO}}$   
 1.05 ↓ MAM, Zorita 80  
 Although coin is too blurred to read, both legends are composed of I and V. It is difficult to establish the sequence.
527. *Obv.*: III + TINI  
*Rev.*: II II  $\overline{\text{II}}$   
 0.89 ↙ MAM, Zorita 75

## GROUP JII 5c

528. *Obv.*: //////////IVVIGILDVS  
*Rev.*: LIVVIGILDIREGIS  
 Mateu y Llopis, pl. VII, 69  
 Coin is a fragment. Photograph too poor to permit a check on the published legend transcription.

## GROUP JII 6

529. *Obv.*: IVCTI //////////NIAN  
*Rev.*: VICTOR ΛΣTO  $\overline{\text{IO}}$   
 1.16 ↙ MAM, Zorita 19

530. *Obv.*: V2ITOI IVINS9C*Rev.*: VCITOP IA2TI  $\overline{\text{NO}}$ 

1.38 ↓ MAM, Zorita 71

This Cabré informs us is of poor gold.

531. *Obv.*: V2ITOI IVINS 9C*Rev.*: VCITOI VI2OI  $\overline{\text{NO}}$ 

1.40 ↓ MAM, Zorita 70

This Cabré informs us is of poor gold.

532. *Obv.*: VITO IVNCO*Rev.*: ITCIV INAI9  $\overline{\text{ONO}}$ 

1.35 ↓ MAM, Zorita 68

This Cabré informs us is of poor gold. Cabré transcribes this:  
VITOIVNC ; ITCIVINAIR.533. *Obv.*: ITIVA2EVC*Rev.*: VICNOIIVA2TIO  $\cdot \overline{\text{CNA}} \cdot$ 

1.49 ↓ MAM, Zorita 69

This Cabré informs us is of poor gold.

## GROUP JII 7

534. *Obv.*: INIVSTINVSPPAIC*Rev.*: ICTO IAAV  $\overline{\text{ONI}}$ 1.48 SAN, see Reinhart, *DJN* 1940, pl. 7, 14535. *Obv.*: ONVTS· NPAIVC*Rev.*: VIVTII· V·NA·VC  $\overline{\text{ONV}}$ 1.45 MEL, see Reinhart, *DJN* 1940, pl. 9, 27536. *Obv.*: ONIVSTI IINVII*Rev.*: VICTR AAVCA  $\overline{\text{CONB}}$ 1.41 WLM, see Reinhart, *DJN* 1940, pl. 9, 24537. *Obv.*: TVSI IIIISVII*Rev.*: VIAIOVIAIVO  $\overline{\text{IINO}}$ 1.44 VD J, WR, see Reinhart, *DJN* 1940, pl. 10, 21538. *Obv.*: LIVVIQ·ILDIR*Rev.*: VICTORIA  $\overline{\text{ONO}}$ 

1.376 Barcelona 21

539. *Obv.*: DN LEVV IQILDIR  
*Rev.*: VISTOI IAVCCC  $\overline{\text{CON}}$   
 1.20 ↙ MAM, Zorita 84  
 Same die as 540.
540. *Obv.*: DN LEVV IQILDIR  
*Rev.*: VISTOI IAVCCC  $\overline{\text{CON}}$   
 1.15 ↙ MAM, Zorita 85  
 Same die as 539.

## CURRU GROUPS

## GROUP C 1

541. *Obv.*: DVNIVTI IVIRVC  
*Rev.*: VPPTVI IIIVTOIV  $\overline{\text{ONO}}$   
 1.45 Mateu y Llopis, pl. V, 48
542. *Obv.*: DVRTLAVII IIAVTЯVC  
*Rev.*: VRTLAVII IILOTЯV  $\overline{\text{CONOC}}$   
 1.42 MAM, WR, see Reinhart, *DJN 1940*, pl. 11, 5
543. *Obv.*: DIIVII IVINVJ  
*Rev.*: RRVТ IVVЯOV  $\overline{\text{CONOC}}$   
 1.39 ↓ LBM
544. *Obv.*: DVRVVI VVIAVC  
*Rev.*: VRVIVI VIVOVЯ  $\overline{\text{OIO}}$   
 1.47 ↓ LBM
545. *Obv.*: IVRTLATN IIIATЯVЯN  
*Rev.*: VVRRT IIIOPЯVЯ  $\overline{\text{CONOC}}$   
 1.40 Carles-Tolra, 998, pl. 21
546. *Obv.*: DVRRVTII IIЯATЯVC  
*Rev.*: VTICVRT ITЛЯVЯ  $\overline{\text{CONOC}}$   
 1.42 ↓ LBM
547. *Obv.*: DIЯTЛITИ IIATЯVЯC  
*Rev.*: VTAVPO IILOTЯV  $\overline{\text{CONOC}}$   
 1.43 ↓ LBM

548. *Obv.*: CVRVRTIII IIIITЯVЯVC  
*Rev.*: TRPVΛI IIIIOΛVЯV ON  
 1.45 ↓ LBM
549. *Obv.*: CVRRTANI IIIVΛTṘṘVC  
*Rev.*: VTΛVRO IIIOТЯV ONOC  
 1.41 ↓ HSA 8116
550. *Obv.*: CVRTΛVNIIINTΛVCSЯVVC  
*Rev.*: VPPATΛII ONOC  
 1.41 HVK, WR, see Reinhart, *DJN* 1940, pl. 11, 3
551. *Obv.*: CVRRVIIIT IIЯΛVЯVC  
*Rev.*: VPPTOT IIIVṘVṘV ONOC  
 1.46 ↓ HSA 508
552. *Obv.*: CVRVTAII ITATЯVVC  
*Rev.*: VRTΛOII IIIOVЯV ONOC  
 1.41 ↓ HSA 15975
553. *Obv.*: CVRTATII IIATVЯVC  
*Rev.*: VTΛVOII IIICVЯV ON  
 1.48 ↓ HSA 15980
554. *Obv.*: CVRIVII IVIЯVC  
*Rev.*: VPPTOV IIIΛVOIV ON  
 1.48 ↓ HSA 16731
555. *Obv.*: CVRRTRVII IIIVЯTΛVVC  
*Rev.*: CVVRTΛV IIICVЯV ONOC  
 ↓ MAC
556. *Obv.*: CVRRTAN IIIVTЯVVC  
*Rev.*: VTΛORRAVIOTΛV ONOC  
 1.45 NMK, see Reinhart, *DJN* 1940, pl. 10, 7
557. *Obv.*: CVRIΛVNI NTΛVRRV  
*Rev.*: VRRVΛTN NVΛTRRVVC ONOC  
 1.45 Mateu y Llopis, pl. V, 51
558. *Obv.*: CVRIVII IVIЯVC  
*Rev.*: VRTVI IIIVOЯV ON  
 1.48 KFM, MAM, VD J, see Reinhart, *DJN* 1940, pl. 11, 6
559. *Obv.*: CVRTATII IIIATЯVЯVC  
*Rev.*: VTΛVOII IIIOVЯV ON  
 VQR 5011

## GROUP C 2

560. *Obv.*: CVRRVΛИ ☆ ☆ ИΤΛVЯЯVC  
*Rev.*: VRRΤΛ + ΜOVЯЯV ON̄O  
 1.47 ↓ HSA 15976  
 May or may not be star forms in obverse legend. Instead they may be letters V or X squeezed.
561. *Obv.*: CVRRVΛIVV TΛVЯЯVC  
*Rev.*: VTΛVOC + ИOVЯЯV |||||  
 1.45 ↓ HSA 15977
562. *Obv.*: CVRRVΛИ ☆ ☆ ИΤΛVЯЯVC  
*Rev.*: |||||/TΛVOC + ИOVЯЯV ON̄O  
 1.45 ↓ HSA 15978
563. *Obv.*: CVRRATNIIIVNΛTVЯЯVC  
*Rev.*: VVRTOIVOЯTΛV ON̄OC  
 1.45 MAB, KFM, PML, see Reinhart, *DJN* 1940, pl. 11, 4
564. *Obv.*: CVRΛTИИ ☆ ИZVЯЯC  
*Rev.*: VΛTIV ИOΛTЯЯV ON̄O  
 1.222 Barcelona 17  
 Amorós and Berruezo record legend: VЯTИИXИZVЯЯC ;  
 VΛTIVИOΛTЯЯV ; ON̄O.
565. *Obv.*: CVRRVΛИ ☆ ☆ ИΤΛVЯЯVC  
*Rev.*: VRRΤΛ + ИOVЯЯV ON̄O  
 1.37 ↓ HSA 7891
566. *Obv.*: CVRRATИ IIIVIIIVΛTЯЯV  
*Rev.*: VRRTI IIHTЯЯV ON̄ON̄O  
 Ashmoleon
567. *Obv.*: VRRΤΛIIIXITΛVЯЯVC  
*Rev.*: VVRTΛ ИTЯЯV ON̄O  
 VQR 5012

## GROUP C 3

568. *Obv.*: VRVOT ИTΛVЯЯVC  
*Rev.*: VVRT ИTΛVЯЯV ON̄O  
 1.39 MAB, NMK, see Reinhart, *DJN* 1940, pl. 11, 9



569. *Obv.*: CVPPII IIIIṖṖVC

*Rev.*: IIṖṖI IIIЯЯЛ ON

1.29 ↓ HSA 15981

570. *Obv.*: CVRRATII IIIVЯЯVC

*Rev.*: VVRRT IИЛVЯЯV ON

1.334 Barcelona 14

Amorós and Berruezo record legends: VRRATIIIIIVЯЯV ;  
VVRRTIИЛVЯЯV ; ON.

571. *Obv.*: CVPPIII IIIṖṖVC

*Rev.*: VRR II IIIṖṖV ON

1.416 Barcelona 15

Amorós and Berruezo record legends: VPIIIIIIIṖṖV ; VRRIIIIIIṖṖV ; ON.

572. *Obv.*: CVPPII II II ṖṖVC

*Rev.*: VPP II II CIIV ON

1.028 Barcelona 16

Amorós and Berruezo record legends: VPIIIIIIIṖṖV ; VPPIIIIICIIV ; ON.

573. *Obv.*: CVRRATIII IIVSIЯVC

*Rev.*: VVRRT IVИЛVЯЯV ON

1.41 ↓ LBM

Coin like this in Grierson Coll. Legends read: CVRRATIIIIIVЯЯVC ;  
CVRRTIИЛVЯЯV ; ON.

574. *Obv.*: CVRVRTIV + MIVЯVC

*Rev.*: VRVRI ИИЯЛVЯV ON

1.29 ↓ HSA 497

ЯЛ in the exergue is a carry-over from legend.

575. *Obv.*: CVRRMV· IIITЛЯVC

*Rev.*: VVRMT ИVMIIЯV ON

1.30 ↓ HSA 16756

576. *Obv.*: CVRRVI + IVЯVC

*Rev.*: VIVRI VVЯV ON

1.19 ↓ LBM

577. *Obv.*: CVRRVTII + IIЛVЯVC

*Rev.*: VVRVI + IIЯVЯV ON

1.27 ↓ ANS

578. *Obv.*: CVIVRI + IIЛVIIVC

*Rev.*: VI//////////VR ИVЯVЯV ON

1.34 ↓ HSA 501

579. *Obv.*: CVRV RV I + IRΛVRV⊔  
*Rev.*: VIVRV R NVRVRV  $\overline{\text{ONO}}$   
 1.30 Mateu y Llopis, pl. VIII, 74  
 Madrid Catalogue illustrations too poor to verify legend inscription of Mateu y Llopis. Also true for coins 580–584.
580. *Obv.*: CVRNV TI + NVRVIV⊔  
*Rev.*: VIVRV II VRΛVRV  $\overline{\text{ONO}}$   
 1.27 Mateu y Llopis, pl. VIII, 75
581. *Obv.*: CVRR... + ... VRVC  
*Rev.*: VVRR I TΛVRRV  $\overline{\text{ONO}}$   
 1.20 Mateu y Llopis, pl. VIII, 77  
 Coin like this in VD J, Mateu y Llopis, pl. I, 9
582. *Obv.*: CVRRAT II VRRV⊔  
*Rev.*: VVRR T ΛVRRV  $\overline{\text{ONO}}$   
 1.35 Mateu y Llopis, pl. VIII, 78
583. *Obv.*: CVRRVT I + INTVRRV⊔  
*Rev.*: VIVRRVI TNVRVRV  $\overline{\text{ONO}}$   
 1.30 Mateu y Llopis, pl. VIII, 76
584. *Obv.*: ⓐVNIOVI IVIINIVIC  
*Rev.*: VICIV⊔ PVIVIIIIV  $\overline{\text{ONO}}$   
 1.30 Mateu y Llopis, pl. VIII, 79
585. *Obv.*: CVRV RV TI R + II V RV RV VC  
*Rev.*: Λ RV RV RI II RV Λ RV V  $\overline{\text{ONO}}$   
 1.32 ✓ MAM, Zorita 78  
 Cabré transcribes legends: CVRV RV TI V + CVRV RV M ; VR RV RI VRANI.
586. *Obv.*: CVRV RV TI V + II V RV RV VC  
*Rev.*: VR RV RI II RV Λ RV V  $\overline{\text{ONO}}$   
 VQR 5014
587. *Obv.*: CVRV RV TI + M V RV RV⊔  
*Rev.*: VIVRV R M V RV RV V  $\overline{\text{ONO}}$   
 1.33 ↓ MAM, Zorita 79  
 Cabré transcribes legends: CVRV RT I + CVRV RV M ; VIVRV VR RV VM.
588. *Obv.*: CIVRRIO + OI RV RV⊔  
*Rev.*: VIVRT II RV RI  $\overline{\text{ONO}}$   
 1.19 ↓ MAM, Zorita 76  
 Cabré transcribes legends: CIVRRIO CVRRIO ; VIVRT NAVIISI.

18\*

589. *Obv.*: CVRRVT + IIIΛVЯЯVC  
*Rev.*: VVRRVII + NЯVVЯVЯV  $\overline{\text{ONO}}$   
 1.35 ↓ HVP, MAM, see Reinhart, *DJN* 1940, pl. 11, 10
590. *Obv.*: CVRRIC + OIЯЯVC  
*Rev.*: VIVRT NΛVЯЯV  $\overline{\text{ONO}}$   
 1.35 AMS, KFM, see Reinhart, *DJN* 1940, pl. 11, 11
591. *Obv.*: CVRRVRVI + ЯΛVЯVC  
*Rev.*: VIVRVRIN VЯSNVЯV  $\overline{\text{ONO}}$   
 1.28 CML, MAM, see Reinhart, *DJN* 1940, pl. 11, 12
592. *Obv.*: CVVIIVIIIOLC  
*Rev.*: VIVVIIVVЯIIIV  $\overline{\text{ONO}}$   
 1.10 WR, see Reinhart, *DJN* 1940, pl. 11, 8  
 Seems to be exactly like Carles-Tolra no. 1000 (pl. 21) transcribed:  
 CVVCILDV ; VIVRIVVЯIV. Photograph too indistinct to verify.

## GROUP C 4

593. *Obv.*: DVDVTV + IVFVJ  
*Rev.*: VVISΔIVIIЯMΛI  $\overline{\text{ONOC}}$   
 1.34 ↓ HSA 16734
594. *Obv.*: DVDVTV + IVFVJ  
*Rev.*: VVIPIVII ЯMΛI  $\overline{\text{ONOL}}$   
 1.27 ↘ HSA 16771
595. *Obv.*: DVDVTV + IVЯVJ  
*Rev.*: VVIPI IVИЯΛΛI  $\overline{\text{ONOC}}$   
 1.40 ↘ MAM, Zorita 77  
 Cabré transcribes this: DVDVTV+CVRVN ; VIRIVHPAAI.  
 It is of poor gold.

## GROUP C 5

596. *Obv.*: CVRRTA OIIV/////////  
*Rev.*: ///////////RRT ///////////ЯЯVC  $\overline{\text{ONO}}$   
 Ashmoleon
597. *Obv.*: CVRTATII NTRTΛVC  
*Rev.*: VVΛTNV VNVЯVC  $\overline{\text{ONO}}$   
 1.45 Mateu y Llopis, pl. V, 49

598. *Obv.*: DVRTVI + ИАТАVC  
*Rev.*: IVATA + ИИНVV  $\overline{ONO}$   
 1.12 ↓ MAM, Zorita 73  
 Cabré transcribes this: CVRVVI+NATAVC ; VATAИИНVV ;  $\overline{ONO}$ .
599. *Obv.*: DVRVΛ////////// NVЯVC  
*Rev.*: VVRTN ИAVTAV  $\overline{OMO}$   
 1.42 Lisbon, B.N., see Ennes no. 8  
 Transcribed with a  $\mathfrak{B}$  in obverse rather than the Я it is. Also at variance is the  $\overline{ONO}$  transcribed in exergue.
600. *Obv.*: AVRTAVИXAVЯTAVC  
*Rev.*: VVRTI ИИТЯV  $\overline{ONO}$   
 VQR 5013
601. *Obv.*: DVRRAT IIIVVVVTVAVC  
*Rev.*: VVRVII IVNTVV  $\overline{ONOC}$   
 1.45 MAM, MMP, see Reinhart, *DJN* 1940, pl. 11, 2
602. *Obv.*: DVRRAT ИИMTAVЯVC  
*Rev.*: VATИИ TAVЯV  $\overline{CONOC}$   
 1.46 ↓ HSA 513

## INCLITUS REX GROUP

603. *Obv.*: + LIVVIGLDVS·RX·  
*Rev.*: INCLITV 2·REX  $\overline{ONO}$   
 Ratto 2433
604. *Obv.*: + IVVIGILDVS  
*Rev.*: INCLITI REX  $\overline{ONO}$   
 1.04 Mateu y Llopis, pl. VII, 70
605. *Obv.*: + IVVIGILDVS $\mathfrak{D}$   
*Rev.*: INCLVT REX  $\overline{ONO}$   
 1.29 Mateu y Llopis, pl. VII, 71
606. *Obv.*: + IVVIGILDVS  
*Rev.*: INCLIT REX  $\overline{ONO}$   
 1.34 Mateu y Llopis, pl. VII, 72
607. *Obv.*: + IVVI + I + PVSИ  
*Rev.*: REX INC + V  $\overline{ONO}$   
 1.36 ✓ MAM, Zorita 89  
 Cabré transcribes this: +IVVI+I+DVSI ; REX INC+V ;  $\overline{ONO}$ .

608. *Obv.*: + IVVI IM + IM + DV

*Rev.*: REX IC + IV

IONOI

1.34 ↓ MAM, Zorita 88

Cabré transcribes this: +IVVIM+VII+DV ; RE+IC+IV ; ONO.

609. *Obv.*: DN + VNV + N +

*Rev.*: RE + INCT

ONO

↓ MAM, Zorita 90

Coin in two pieces. Impossible to read or verify Cabré's rendition of legend. He also refers to it as being "cobre chapado de ora."

610. *Obv.*: + IVVIGI + DVS

*Rev.*: INC + ITVS REX

ONO

1.30 ↓ LBM; see Heiss, pl. I, 2

611. *Obv.*: + LIVVIGILDVS P+

*Rev.*: INCLITVS RCGN

ONO

1.29 ↓ PBN, see Heiss, pl. I, 3

612. *Obv.*: + IVVIGI + DVS

*Rev.*: INC + V REX

ONO

1.29 VQR, see Heiss, pl. I, 4

613. *Obv.*: + LIVVIGILDVS PX

*Rev.*: INCLITVS RCGN

ONO

1.29 ↓ PBN, see Heiss, pl. I, 4a

614. *Obv.*: XIVVI CIXDVSb

*Rev.*: S REX INCXITV

ONO

1.23 AMS, see Reinhart, *DJN* 1940, pl. II, 13; Miles, pl. I, 8

615. *Obv.*: + IVV CI + DVI ~

*Rev.*: ~ RE + IC + ITI

ONO

1.37 ✓ HSA 7892, see Miles, Type H, 8d, pl. I, 9

616. *Obv.*: LIVVICI LDV2D

*Rev.*: 2 REX INCLTV

ONO

Mahudel, pl. 11, 5; Miles, Type H, 8e, p. 179

617. *Obv.*: LIVVICI LDV2V

*Rev.*: 2 ~ + XNCLITV

ONO

Mahudel, pl. 11, 4; Miles, Type H, 8f, p. 179

618. *Obv.*: + IVVICI + DVS

*Rev.*: ~ REX INC + ITV

ONO

1.24 Formerly W. Reinhart Coll., see Miles, Type H, 8g, p. 179

Two coins like this in VDJ, Mateu y Llopis, pl. I, 7-8.

619. *Obv.*: XIVVIC + IXPV↪  
*Rev.*: I REX INCXV       $\overline{\text{ON}\overline{\text{O}}}$   
 1.31 ↙ HSA 16002, see Miles, Type H, 8h, p. 179, pl. I, 10
620. *Obv.*: XIVVIC + IXPV↪  
*Rev.*: I REX INCXITV       $\overline{\text{ON}\overline{\text{O}}}$   
 1.32 ↓ HSA 16003, see Miles, Type H, 8i, p. 179, pl. I, 11
621. *Obv.*: XIVVIC + IXDVI  
*Rev.*: I REX INCXV       $\overline{\text{ON}\overline{\text{O}}}$   
 1.32 ↙ HSA 16781, see Miles, Type H, 8j, pl. I, 12
622. *Obv.*: + IVVI + GIXDV  
*Rev.*: REX INCXV       $\overline{\text{CON}\overline{\text{O}}}$   
 VQR 5017
623. *Obv.*: + IVVIG IXDVS  
*Rev.*: I REX INCXITV       $\overline{\text{ON}\overline{\text{O}}}$   
 VQR 5015
624. *Obv.*: + IVVIG IXDVS  
*Rev.*: REX INCXV       $\overline{\text{ON}\overline{\text{O}}}$   
 VQR 5016
625. *Obv.*: + I + DVS + IVVIG  
*Rev.*: INCLITV REX       $\overline{\text{ON}\overline{\text{O}}}$   
 1.32 Barcelona 20
626. *Obv.*: + IVVIGI + DVS  
*Rev.*: INC + VS REX       $\overline{\text{ON}\overline{\text{O}}}$   
 1.33 Barcelona 22
627. *Obv.*: + IVVI GI + PVS↪  
*Rev.*: ↪ RE + INC + ITV       $\overline{\text{ON}\overline{\text{O}}}$   
 Florez, p. 170
628. *Obv.*: XIVVICIXDV  
*Rev.*: REX INCLI       $\overline{\text{ON}\overline{\text{O}}}$   
 Velazquez, 14, see Miles, Type H, 8p, p. 180
629. *Obv.*: LIVVIGILDVS  
*Rev.*: REX INCLI       $\overline{\text{ON}\overline{\text{O}}}$   
 Museu de Belem, Lisbon, see Miles, Type H, 8q, p. 180

630. *Obv.*: LDV R + LIVVICI

*Rev.*: 2 RCCN INCLITV ONÖ

Reinhart, *DJN* 1940, pl. 11, 15; Miles, Type H, 8s, p. 180.

## HERMENEGILD GROUPS

### GROUP H 1

631. *Obv.*: ERMEN EQILDI

*Rev.*: INCLIT I REC— ONÖ

1.42 ↑ HSA 16013, Miles 46a

Not an authentic coin.

### GROUP H 2

632. *Obv.*: ERMEN ·EQLD:—

*Rev.*: INCLIT R EQI

1.37 PBN

633. *Obv.*: ERMEN IQILDI:—

*Rev.*: INCLIT IREC

1.32 VQR 5032

### GROUP H 3

634. *Obv.*: ·ERMENEQILDI

*Rev.*: REQIADE O VITA ONÖ

1.35 Mateu y Llopi, pl. VII, 73

635. *Obv.*: ·ERMENEQILDI

*Rev.*: REQIADE OVITA ONÖ

1.26 ↓ LBM 4A, acquired 1863, Miles 47(b), pl. III, 14

### GROUP H 4

636. *Obv.*: ·ERMENEQILDI

*Rev.*: REQIADEOVITA ONÖ

2.247 Barcelona 30

Not an authentic coin.

637. *Obv.*: ·ERMENEQILDI

*Rev.*: REQIADEOVITA ONÖ

1.465 Barcelona 31

Not an authentic coin.

## UNSORTED COINS

## ANASTASIUS

638. *Obv.*: DNANΛZT IVSPPAI  
*Rev.*: IVCTOR /// ONΘ  
 PG
639. *Obv.*: DNANAS· IVSPPAΛ  
*Rev.*: VICTORIA ΛΛVΛC ////////////////////  
 A in left reverse field  
 1.39 ↓ PBN, Alesia Hoard  
 Coin very blurred. Illegible letter in reverse field may be A or Я or N.
640. *Obv.*: ////////////// NANASTASV //////////////PPAVC  
*Rev.*: ////////////// ICTO.....T OCIV VONΘ  
 † in right obverse field; • in left reverse field; ♡ in right reverse field  
 1.35 ↓ HSA 16686  
 This coin with its unusual conglomeration of symbols in reverse and obverse fields is most likely a part of Group A 2c.
641. *Obv.*: DNIIASTA SIVISPPAVC  
*Rev.*: IICIOPAI CPOCII VOHOΘ  
 † in right obverse field; • in left reverse field; ♡ in right reverse field  
 1.39 ↓ PG  
 Poorer example of 640. Very close to coins in Group A 2c.
642. *Obv.*: DNANASTA SIVSPPAVC  
*Rev.*: VCTO//////////////////CVSTORVAM CONOB  
 0.925 ↓ PBN  
 M. Jean Lafaurie of the Cabinet des Médailles informs us that this is a "fourré."
643. *Obv.*: DNANAST ASIVSPRC  
*Rev.*: =TOPIAI VSTORVI CONOB  
 1.47 ↓ PG  
 Originally from the Grantley Coll., no. 2782. It belongs to a sub-group of A 1 with letters in field.
644. *Obv.*: IIΛIT IVIIΛIV  
*Rev.*: ////////////////CEN //////////  
 ↓ PG  
 Originally from Grantley Coll., no. 2791. Grierson, who has kindly read the legends for me, states that the letters are little more than blundered strokes and that the exergue is only approximated.



## JUSTINIAN I

645. *Obv.*: INIVNI ANVIPAC*Rev.*: VICTRI ANCIAM 

1.44 ↓ PG

May very well be an example of JAN 3.

646. *Obv.*: IIIVITII· ·IAIIVIC*Rev.*: VICT· ·ANII: 

1.39 ↓ PG

Might be placed in Group JAN 1 with 241. Suggests connections also with JAN 2b (294), JAN 8 (370). Mr. Grierson purchased this from Christie Lot 39, June 16, 1959.

647. *Obv.*: DNIVSTII ANVSPAV*Rev.*: VICTOI VOITO 

1.30 ↓ LBM

May be a variation of JAN 5. The Victory walks to left.

648. *Obv.*: DNIVSTINI ANVSPPAVD*Rev.*: VICTORIA ///////////////VSTORIA 

1.46 ↓ LBM

May be a variation of JI 1.

649. *Obv.*: DVSTI IIIANIVI*Rev.*: VICTOI ///////////////VTI 

1.395 ↓ PBN

Most likely a Merovingian variation.

650. *Obv.*: IVSTI NIANI*Rev.*: DSIT NAIAN 

Ashmoleon

The Victory walks to left.

## JUSTIN I—JUSTIN II

651. *Obv.*: IVSTIN VSPNA*Rev.*: VICTORI AP//////////////// 

1.40 ↓ PBN, Alesia Hoard








Possibly a JI 1 variation.

652. *Obv.*: DNIVSTIN VSPPAVC*Rev.*: VIC//////////////////////// 

Δ in left reverse field

1.46 ↓ PBN

Too worn to be able to classify.

653. *Obv.*: CIOIN VIITI  
*Rev.*: CNI TOI   
 Star in right reverse field  
 1.41 ↓ HSA 521  
 May be classified with JII 3.
654. *Obv.*: 3AITII IIAVI  
*Rev.*: CICTI TOIAVI   
 1.44 ↓ HSA 16789  
 May be classified with JII 3.
655. *Obv.*: VN/////////  
*Rev.*: //////////ICT/////////   
 1.45 ↓ HSA 16788  
 Coin very crude, worn, cut. Most likely a Merovingian variation because of the broad large head so often seen in their issues.
656. *Obv.*: DN VITI IIAIVTO  
*Rev.*: .: VIOT . . . VP   
 1.27 ↓ ANS, ex W. Reinhart Coll.  
 Quality of the gold and texture of coin are unique.
657. *Obv.*: 3MOT INIVAIC  
*Rev.*: IOTVIC NC INA   
 1.44 ↓ MAM, Zorita 6  
 May be a Merovingian variation of JAN 3.
658. *Obv.*: (Too blurred to be legible)  
*Rev.*: (Too blurred to be legible)  
 C in right reverse field  
 1.465 ↓ PBN, Alesia Hoard  
 Too worn and illegible to classify.
659. *Obv.*: IT· II· : II ·|·  
*Rev.*: + ITIOV IVITI   
 1.45 ↘ HSA 16760  
 A blundered strike. May be part of JAN 8, e.g., 380.
660. *Obv.*: IIVITAIIII LICVDVVC  
*Rev.*: IVIIC IIVIIIV   
 1.37 ↓ PG  
 Coin pierced. Original weight greater. Obverse legend suggests beginning of a "curru" form. May be a variation of Group JII 4a, e.g., 495, 500.



## THE CHARTS



## THE CHARTS





## GENERAL ABBREVIATION KEY TO CHARTS

### MINTS

ALE	- Alexandria
ANT	- Antioch
AQU	- Aquileia
ARE	- Arelate (Arles)
CON	- Constantinople
CYZ	- Cyzicus
HER	- Heraclea
LUG	- Lugdunum (Lyons)
MED	- Mediolanum (Milan)
NIC	- Nicomedia
RAV	- Ravenna
ROM	- Roma
SIR	- Sirmium
SIS	- Siscia
THE	- Thessalonica
TRE	- Treveri (Trier)

### TYPES

+	- Cross-in-wreath
	- Chrismon-in-wreath
	- Rho Cross-in-wreath
*T*	- Trophy between stars
VGC	- Victory with <i>globus cruciger</i>
VLC	- Victory with Long Cross
VOT	- Victory with Votive Shield
VPW	- Victory with Palm and Wreath
VTW	- Victory with Trophy and Wreath
VWW	- Facing Victory with Wreath in each hand

### DENOMINATIONS

Æ 3, Æ 4	- AES 3, AES 4
½ Sil	- Half-siliqua
LMS	- Light Miliarensis (A)
MED	- Medallion
MUL	- Multiple (A)
SEM	- Semis (A)
SIL	- Siliqua



CHART I. TREMISSES IN THE Vth CENTURY

	TRE	LUG	ARE	MED	AQU	RAV	ROM	CON	CON*
<b>Honorius</b> (395-423)				VGC		VGC	VGC	VGC	
<b>Arcadius</b> (395-408)	VPW			VGC		VGC	VGC	VGC	+ - Eudocia
<b>Theodosius II</b> (408-450)								*T* VGC	+ - Eudocia
<b>(Priscus Attalus)</b> (409)									
<b>(John)</b> (423-425)						VPW VGC			
<b>Valentinian III</b> (425-454)				VGC +		+	VGC ✱ +		
<b>Marcian</b> (450-457)				+				VGC +	+ - Pulcheria
<b>Avitus</b> (455-457)			+	+		+	+		
<b>Majorian</b> (457-461)			+	+		+	+		
<b>Leo I</b> (457-474)				+				VGC +	+ - Aelia Verina
<b>Severus</b> (461-465)				+		+	VLC +		

☛ <b>Anthemius</b> (467–472)	+	+	+	+
<b>Olybrius</b> (472)	+			+
<b>Glycerinus</b> (473–474)	+		+	+
<b>Julius Nepos</b> (473–475)	+	+	+	+
<b>Leo II</b> (473–474)				VGC +
<b>Romulus Augustulus</b> (475–476)	+	+	+	+
<b>Zeno</b> (474–491)	+	+	+	+
				VGC + – Aelia + Ariadne VLC
<b>Basiliscus</b> (491–492)	+	+	+	+
				VGC +
<b>Anastasius</b> (491–518)	←	VPW (Mints in the West?)		↑

\* Coins issued in names of Emperors

CHART II. TREMISSIS AND 1½ SCRIPULUM IN THE LATE IVth CENTURY\*

	LON	TRE	LUG	ARE	MED	AQU	RAV	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE
<b>Valens</b> (364-378)		vpw						vpw			vpw	vww	vpw		vpw		vot
<b>Valentinian I</b> (364-375)		vpw									vww	vot					vot
<b>Gratian</b> (375-383)		vpw				vpw	vpw	vpw			vpw						vot
<b>Valentinian II</b> (378-392)		vpw	VPW			vpw	vpw	VPW					vot		VGC		
<b>Theodosius</b> (379-395)		VPW	VPW			vpw	VPW	VGC					vot		VGC		
<b>Flacilla</b>													✱				
<b>Magnus Maximus</b> (383-388)		VPW	VTW			VPW	VPW										
<b>Flavius Victor</b>						VPW											
<b>Eugenius</b> (392-394)			VPW			VPW											
<b>Arcadius</b> (395-408)		VGC	VPW			VGC		VGC					vgc		VGC		
<b>Honorius</b> (395-423)		VGC				VGC		VGC					VGC				

\* 1½ Scripulum: lower case; Tremisses: upper case



CHART III. VPW IN OTHER DENOMINATIONS IN GOLD & SILVER, LATE IV<sup>th</sup>-V<sup>th</sup> CENTURIES

	LON	TRE	LUG	ARE	MED	AQU	RAV	ROM	SIS	SIR	THE	HER	CON	NIC	ANT	ALE
<b>Valens</b>			Sem	Sil												
<b>Valentinian I</b>					Sem										Sem	
<b>Gratian</b>			$\frac{1}{2}$ Sil			Sil										
<b>Valentinian II</b>			Sil	Sil		Sil										
<b>Theodosius</b>					$\frac{1}{2}$ Sil	$\frac{1}{2}$ Sil	$\frac{1}{2}$ Sil	$\frac{1}{2}$ Sil								
<b>Magnus Maximus</b>		Sil	Sem			Sil										
<b>Flavius Victor</b>						Sil										
<b>Eugenius</b>			Sil		$\frac{1}{2}$ Sil											
<b>Arcadius</b>		Sil		$\frac{1}{2}$ Sil	$\frac{1}{2}$ Sil	$\frac{1}{2}$ Sil	Sil								Sil	
<b>Honorius</b>				$\frac{1}{2}$ Sil												
<b>Theodosius II</b>																
<b>(Priscus Attalus)</b>			LMS Sil												Mul (AR)	
<b>(John)</b>							$\frac{1}{2}$ Sil									
<b>Valentinian III</b>															Sil	
<b>Marcian</b>																
<b>Avitus</b>																
<b>Majorian</b>																
<b>Leo I</b>																

<b>Severus</b>	Sil
<b>Anthemius</b>	
<b>Olybrius</b>	
<b>Glycerinus</b>	Sil
<b>Julius Nepos</b>	
<b>Leo II</b>	
<b>Romulus August.</b>	
<b>Zeno</b>	Sil
<b>Basiliscus</b>	
<b>Anastasius</b>	Sil
<b>Justin I</b>	
<b>Justinian</b>	Sil

CHART IV. VPW IN BRONZE, LATE IVth-Vth CENTURIES\*

	TRE	LUG	ARE	MED	AQU	RAV	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE	?
<b>Valens</b>	Æ3	Æ3	Æ3	Æ3	Æ3		MED	Æ3	Æ3	Æ3	Æ3	Æ3	Æ3	Æ3	(Æ3)	Æ3	Æ3
							Æ3										
							Æ4										
<b>Valentinian I</b>	Æ3		Æ3		Æ3		MED	Æ3	Æ3	Æ3	Æ3	Æ3	Æ3	(Æ3)	Æ3	Æ3	Æ3
							Æ3										
<b>Gratian</b>	Æ3	Æ3	Æ3	Æ3	Æ3		MED	Æ3	Æ3		Æ3	Æ3	Æ3	(Æ3)	(Æ3)	Æ3	Æ3
							Æ3										
							Æ4										
<b>Valentinian II</b>	MED	MED	Æ3		MED		Æ3	Æ3	Æ3		Æ3						Æ3
	Æ3	Æ4	Æ4	Æ3	Æ3		Æ4	Æ4	Æ4								
	Æ4				Æ4												
<b>Theodosius</b>	Æ4	Æ4	Æ4	Æ3	Æ3		Æ3	Æ3	Æ3								
				Æ4	Æ4		Æ4	Æ4	Æ4								
<b>Magnus Maximus</b>		Æ4															Æ3
<b>Eugenius</b>	Æ4	Æ4	Æ4	Æ4	Æ4		Æ4										Æ3
<b>Arcadius</b>	Æ4	Æ4	Æ4	Æ4	Æ4		Æ4	Æ4	Æ4								
<b>Honorius</b>		Æ4	Æ4				Æ4										Æ3
<b>Constantius III</b>		Æ4															
<b>Theodosius II</b>																	
<b>Priscus Attalus</b>			Æ4				Æ3										
<b>John</b>			Æ4														
<b>Valentinian III</b>		Æ4					Æ4										

<b>Marcian</b>				
<b>Avitus</b>	Æ4			
<b>Majorian</b>	Æ4	Æ4		
<b>Leo I</b>	Æ4			
<b>Severus</b>				(Æ3) (Æ3)
<b>Anthemius</b>				
<b>Olybrius</b>				
<b>Glycerinus</b>				Æ3
<b>Julius Nepos</b>				
<b>Leo II</b>				
<b>Romulus August.</b>				
<b>Zeno</b>	Æ4			

\* ? : Unclassified; ( ) : Very Rare





# CHART V. ABBREVIATION KEY

FR = Felicitas Romanorum  
 GR = Gloria Romanorum  
 SR = Securitas Reipublicae  
 SalR = Salus Reipublice  
 SpR = Spes Romanorum  
 VA = Victoria Augustorum, Victo Avg, Victoria Avg, Victoria Avgg,  
 Victoria Avggg, Victoria Avgus  
 VE = Victoria Exercitus  
 VR = Victoria Romanorum  
 NL = No Legend  
 VDD = Victoria DDNNAV  
 \* = Double VPW type  
 ( ) = Rare Issues

Capital letters = Æ3 Issues  
 Lower case letters = Æ4 Issues

CHART V. LEGEND ASSOCIATIONS WITH VPW TYPES IN Æ3 AND Æ4 ISSUES.

	TRE	LUG	ARE	MED	AQU	RAV	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE	?
<b>Valens</b>	(GR) SR	SR (VDD)	SR (FR)	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR
<b>Valentinian I</b>	(GR) SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR
<b>Gratian</b>	(GR) SR (VA)	SR SR	SR (FR) (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)	SR (VA)
<b>Valentinian II</b>	(GR) VA va	VA VA va	(SR) VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)	SR VA (va)
<b>Theodosius</b>	va	va	va	(VA) (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)	VA (va)
<b>Magnus Maximus</b>	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va
<b>Eugenius</b>	(va)	VA (va)	(va)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)	(SpR)
<b>Arcadius</b>	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va
<b>Honorius</b>	va	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)	(va)
<b>Constantinus III</b>	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va	va
<b>Theodosius II</b>																	
<b>Priscus Attalus</b>																	
<b>John</b>																	

**Valentinian III  
(Placidia)**

Avitus	va	va salr SalR	va
Majorian	va	va	va
Leo I		va	
L. Severus		va	NL
Glycerinus			VA
Julius Nepos			
Romulus August.			
Zeno	va		

*Charts*

273



CHART VI. ABBREVIATION KEY

Sp	- Spain
Af	- Africa
Amb	- Ambianum
CC	- Caesarea Cappadocia
C	- Cyprus
E	- Emesa
I	- Illyricum
J	- Judaea
K	- Carthage
Lao	- Laodicaea
Tic	- Ticinum
Lon	- Londinium
M	- Moesia
N	- Narbonne
O	- Ostia
Rav	- Ravenna
S	- Serdica
T	- Tripolis
As	- Asia
*	- other mints in operation

CHART VI. INCIDENCE OF VPW TYPES IN GOLD, SILVER, BRONZE

	TRE	LUG	ARE	MED	TIC	AQU	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE	SP	OTHER
<b>Octavian Augustus</b>									R								*	* Af
<b>Tiberius</b>									*									* CC
<b>Caligula</b>		*							*									* CC
<b>Claudius</b>									R									* CC
<b>Nero</b>			Æ						Æ									* CC
<b>Galba</b>			R						A								R	* Af
			Æ						Æ									
<b>Otho</b>									A									
<b>Vitellius</b>		*							A								*	
<b>Vespasian</b>		A							A								R	A J
		R							R								Æ	* I
		Æ							Æ									* As
<b>Titus</b>		*							R									* As
									Æ									
<b>Domitian</b>		*							A									
									R									
<b>Nerva</b>									A									* As
									R									
<b>Trajan</b>									A									* As
									R									* C
									Æ									

<b>Hadrian</b>	<i>N</i> <i>R</i> <i>Æ</i>	* ?
<b>Antoninus Pius</b>	<i>N</i> <i>R</i> <i>Æ</i>	
<b>Marcus Aurelius</b>	<i>N</i> <i>R</i> <i>Æ</i>	
<b>L. Aurelius Verus</b>	<i>N</i>	
<b>Commodus</b>	<i>N</i> <i>R</i> <i>Æ</i>	
<b>Pertinax</b>		
<b>Didius Julius</b>		
<b>Sept. Severus</b>	<i>R</i> <i>N</i> <i>R</i> <i>Æ</i>	<i>N</i> <i>N</i> Lao * As
<b>Caracalla</b>	<i>N</i> <i>R</i>	
<b>Geta</b>	<i>N</i> <i>R</i>	
<b>Macrinus</b>	<i>N</i> <i>R</i> <i>Æ</i>	*
<b>Elagabalus</b>	<i>N</i> <i>R</i> <i>Æ</i>	<i>N</i>





Volusian	N	R	Æ	*
Aemilian	R	Æ		
Uranus Antoninus				A E
Valerian	N	R	Æ	* M
Gallien	N	R	Æ	* T * M * A <sub>S</sub> * S
Claudius II	N	R	Æ	* S * T * M
Quintillus				
Aurelian	N	R	Æ	A f * S
Tacitus	N	R	Æ	* S * T
Florian	N	R	Æ	* ?
Probus	N	R	Æ	* T * S
Carus	N	R	Æ	A T * S

	TRE	LUG	ARE	MED	TIC	AQU	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE	SP	OTHER
Diocletian	*	A				*	A	*	*	*	*	*	*	*	*	*	*	* S * T * Lon * K
Maximian	*	A				*	*	*	*	*	*	*	*	*	*	*	*	* Lon * T * S * K * O
Domitian Achile																		
Constantius I	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* Lon * S * K * O
Galenus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* Lon * S * K * O
Severus II	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* Lon * S * K
Maximinus II Daza																		
Maxentius	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* R ? * Æ ? * O

Licinius	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	* Lon * S * O
Constantine I	A'	*	*	*	*	*	*	A'	*	A'	*	*	*	*	*	*	A', * Lon * S * K Æ, * O
F. J. Delmatius								A'		A'		A'					
Constantine II	A'	*				*	R	R	*	A'	*	A'	*	A'	*	*	* Lon * S * K, * O Æ
Constantius II	A'	R	R			*	*	A'	R	*	*	A'	*	A'	*	A'	* Lon * N Æ, * Amb
Constans	A'	R				*		R		A'	*	A'		R	*	*	* Lon Æ
F. Mag. Magnentius																	
Julian	R	R	*			*	R	*	*	*	*	A'	*	*	*	*	A' Æ
Jovian		*				*	Æ	*	*	*	*	*	*	*	*	*	
Valentinian I	A'	A'	Æ	*		Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	* Rav
Valens	A'	R	Æ			Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ	Æ

	TRE	LUG	ARE	MED	TIC	AQU	ROM	SIS	SIR	THE	HER	CON	CYZ	NIC	ANT	ALE	SP	OTHER
<b>Gratian</b>	N			N	N	N				N		N						
	R	*			R	R												
	Æ			Æ	Æ	Æ		Æ		Æ		Æ	Æ	Æ	Æ	Æ		Æ
<b>Valentinian II</b>	N	N		N	N	N						N						
	R	R			R	R		R		*			*	*	*	*		
	Æ	Æ	Æ	Æ	Æ	Æ		Æ		Æ			*	*	*	*		Æ
<b>Theodosius</b>	N	N		N	N							N						
				R	R	R		R	*	*	*	*	*	*	*	*		
	Æ	Æ	Æ	Æ	Æ	Æ		Æ					*	*	*	*		Æ
<b>Maximus</b>	N			N	N	N												R Lon
		Æ	*		Æ	Æ	*	Æ				*						Æ
<b>Flavius Victor</b>																		R

# CHART VII. ABBREVIATION KEY

## Collections

- AMI – A. Morrocos, Idanha a Velha (Reinhart, *DJN 1940*)
- AMS – Archivo Municipal de Sevilla
- ANS/HSA – American Numismatic Society and Hispanic Society of America, New York
- CCL – Costa Couvreur, Lisbon (Reinhart, *DJN 1940*)
- CML – Casa da Moeda, Lisbon (Reinhart, *DJN 1940*)
- CRC – C. R. Coruña (Reinhart, *DJN 1940*)
- CT – Carles-Tolra, Barcelona (now dispersed)
- DIC – Douglas P. Dickie, Ridgefield, New Jersey, U.S.A.
- DO – The Dumbarton Oaks Research Library & Collection, Harvard University in Washington, D.C.
- ENP – Eduard Nieport, Porto (Reinhart, *DJN 1940*)
- HEI – Heiss
- HVK – Hess Verst. Katalog, Juni 1922 (Reinhart, *DJN 1940*)
- HVP – Hans H. Völkers, Prag (formerly Madrid) (Reinhart, *DJN 1940*)
- JH – Johns Hopkins University, Baltimore, Maryland, U.S.A.
- KFM – Kaiser Friedrich-Museum, Berlin (Reinhart, *DJN 1940*)
- MAB – Museo Arqueológico, Barcelona (Reinhart, *DJN 1940*)
- MAC – Museo Arqueológico, Córdoba
- MAM – Museo Arqueológico, Madrid (Reinhart, *DJN 1940*)
- MCA – Musée Calvet, Avignon (Reinhart, *DJN 1940*)
- MEL – Museu Etnológico, Lisbon (Reinhart, *DJN 1940*)
- MML – Museu Municipal, Lisbon (Reinhart, *DJN 1940*)
- MMP – Museu Municipal, Porto (Reinhart, *DJN 1940*)
- NMK – Nationalmuseum, Kopenhagen (Reinhart, *DJN 1940*)
- PG – Philip Grierson, Cambridge, England
- PPC – Paiva Pessoa, Castelo Branco (Reinhart, *DJN 1940*)
- RAT – Ratto Catalog
- RSL – R. Shore, Lisbon (Reinhart, *DJN 1940*) (now dispersed)
- SAN – Société Archéologique, Narbonne (Reinhart, *DJN 1940*)
- SMM – Staatl. Münzsamml., Munich (Reinhart, *DJN 1940*)
- TOL – Tolstoi
- VDJ – Inst. Valencia Don Juan, Madrid
- VQR – Vidal Quadras y Ramon, Barcelona (now in Private Coll., Paris)
- WLM – Württemb. Landesmuseum, Stuttgart (Reinhart, *DJN 1940*)
- WR – Wilhelm Reinhart, Madrid (Reinhart, *DJN 1940*) (now dispersed)
- \* – Coins with letters in their field in groups in which this is not a common feature.
- ? – Coins in variable sub-groups

CHART VII. NUMBERS OF COINS STUDIED BY STYLE GROUPS AND BY COLLECTION

	ANS/HSA	Mateu y Llopis Madrid	Zorita de los Canes	M. A. Córdoba	MAB	Barcelona	A. M. Seville	VQR	Other Spanish	Portuguese	Paris, B. N.	Other French	London, B. M.	Ashmolean	Others	Total	Alesia Hoard	Gourdon Hoard
A1	11 2? 3*	4								4 7? 7*			2?	1	Dic	41	2	4
A2	2 6?							2?		2 7? 1*			3			23	1	3
A3	5 1* 1?	1		1				1	VDJ	3 2? 5*			6 2*	1	1 DO 1 PG	31	2	1
A4	2 2?									3 1*				1?		9	1	1
A5	9 1	1						1		2 1*						14	1	
A6	2 3*	2								1			2		2 Tol	12		
A7	5												2		2 Tol	9		
Total	53	9		1				3	1	46			17	2	7	139	(7)	(9)

# Charts

285

<b>Jl 1</b>	6	5	1?	1	1	3	VDJ	1	PPC	11	6?	1*	6	1	1	PG	48	7	3
<b>Jl 2</b>	5	2	1?			1	VDJ	1	MML	9	1?		5		3	PG	32	3	2
							WR									1 Tol			
								1	SMM							1 HVK			
<b>Jl 3</b>	2	2		1	1	2	WR						1	SAN	1	1	PG	14	1
							VDJ						1	MCA		1?	PG		
<b>Jl 4</b>	2									3			1				6	1	1
<b>Jl 5</b>								1	CT		1				1	1	Rat	4	
<b>Total</b>	16	10		2	2	11		2		32	2		15	3	9		104	(12)	(6)
<b>Jan1</b>	3	1		1			1	VDJ	1	MEL	6		1			1	Rat	16	
							WR												
<b>Jan2</b>	7	2	6	2	1?	1	1	WR	1	RSL	4	1	SAN	6	3	1	NMK	57	
	4?	1*	1?			1?	1	VDJ			2?	1?	SAN	4?	1?	2?	PG		
							1?	VDJ			1*								
<b>Jan3</b>	5	2							1	MEL	1		4	1	1	Rat	18	1	
	2?												1?						
<b>Jan4</b>	2	3	1?	1		1	3	WR	1?	MEL	2		3	1	1	HVK	24		
								2	MAM							1?	PG		
								1	VDJ										
								1	WLM										
<b>Jan5</b>	7	5	4	1	1	2		1	CRC		1	1	SAN	4		1	SMN	30	
																	1 Dic		
																	1 WLM		



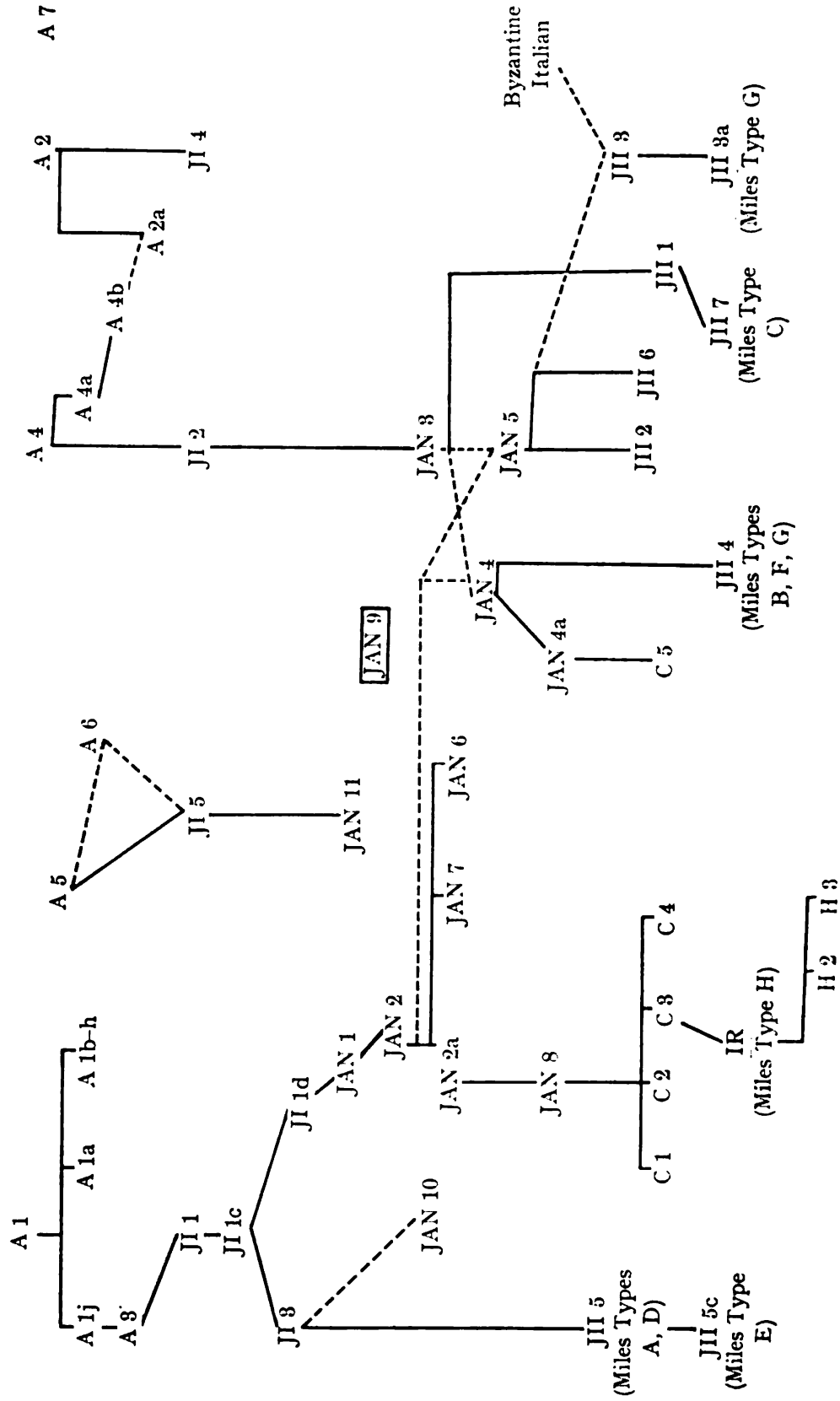
	ANS/HSA	Mateu y Lloplis Madrid	Zorita de los Canes	M. A. Córdoba	MAB	Barcelona	A. M. Seville	VQR	Other Spanish	Portuguese	Paris, B. N.	Other French	London, B. M.	Ashmolean	Others	Total	Alesia Hoard	Gourdon Hoard
Jan6	2	1														3		
Jan7	3															3		
Jan8	3	6		1		2	2 MAM 1? 1 AMI 2? WR		3	1?	3	2	2	1	1 HVK 1 WLM	27		
Jan9	1									2						3	1	1
Jan10	1	1														2		
Jan11	2									6?					2 Tol 1 NMK	12	1	
Total	43	23	11	1	4	5	6	18	4	29	3	26	7	15		195	(1)	(3)
JH1	1	1											1			3		
JH2	1	18	6?	1	2		1 VD J 1 MAM 1 WR		1 MML							32		
JH3	1	2	16	1	1	1	2 WR 1 MAM		2 SAN					1		39		
JH4	2?	5	1	2?	1?	1?	1? 1 WR 1 MAM 1 HVP 1 VD J		1 PPC 1 CCL 1 RSL				2	2 WR		25		

Charts

287

<b>JII5</b>	3	8	2?	2	3	2	4	MAM	1	ENP	2	1	1	JH	37
		1?					2	VDJ						1	Hei
							2	WR							
							1	CT							
							1	HVP							
<b>JII6</b>		5													5
<b>JII7</b>		2		1			1	VDJ	1	MEL	1	SAN	1	WLM	8
							1	WR							
<b>Total</b>	9	18	64	4	4	4	3	22	6	2	3	3	2	5	149
<b>C1</b>	5	2	1				1	2	MAM			5		1	HVK
								2	WR					1	NMK
								1	VDJ					1	KFM
								1	CT						
<b>C2</b>	4			1	1	1			1	CML			1	1	KFM
															10
<b>C3</b>	5	6	3	1	3	1	1	2	MAM	1	CML	2		1	NMK
								1	WR					1	HVP
								1	VDJ					1	KFM
<b>C4</b>	2		1												3
<b>C5</b>	1	1	1				1	1	MAM	1	MML		1		8
										1	MMP				
<b>IR</b>	4	3	3		2	1	3	2	VDJ		2		1	1	Rat
															22
<b>Total</b>	21	12	8	1	2	6	2	7	13	4	2	8	2	8	96
<b>Total JII, C, IR</b>	30	30	72	1	6	10	6	10	35	10	4	3	11	4	245
<b>Grand Total</b>	142	72	83	2	10	18	6	21	65	16	111	8	69	16	683

## CHART VIII. STYLE GROUP PROGRESSIONS



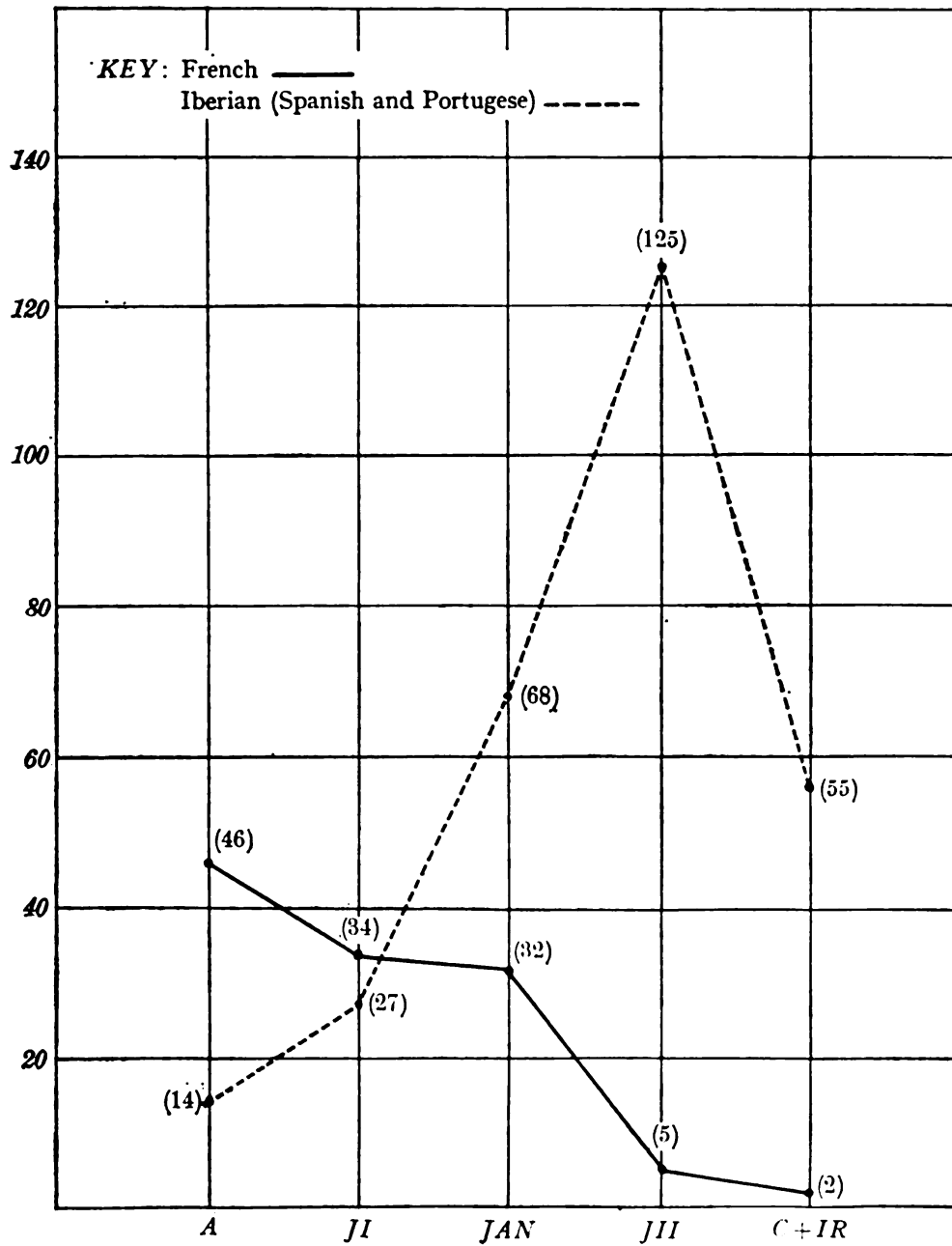


CHART IX. QUANTITATIVE GRAPH OF FRENCH AND IBERIAN COLLECTIONS STUDIED

CHART X. FREQUENCY TABLE OF WEIGHTS OF COINS IN MAJOR GROUPS

	0-1.00	1.01-1.05	1.06-1.10	1.11-1.15	1.16-1.20	1.21-1.25	1.26-1.30	1.31-1.35	1.36-1.40	1.41-1.45	1.46-1.50	1.51-1.55	1.56-1.60	Avg. Wt. in largest Group	Avg. Wt. of all specimens of known wt.
A1											15	4		1.48	1.49
A2											4			1.47	1.47
A3								1	2	8	3			1.44	1.43
A4					1					2	1			1.44	1.38
A5									1	2	4			1.47	1.46
A6									1	4	1			1.437	1.431
A7									1	2	1			1.45	1.444
J11	1				1			1	6	16	5	1		1.4318	1.4238
J12						1		1	5	14	3			1.4428	1.4262
J13									1	1	3	1		1.4866	1.4716
J14											5	1		1.4360	1.4466
J15						1			1						1.35
Jan1					1	1	1		3	3	3			1.42	1.3808
Jan2				3		1	1	2	2	13	5			1.4292	1.3807
Jan3			1					1		8	1	1		1.4362	1.4100
Jan4									3	7	2			1.430	1.430

# Charts

29I

Jan5	1	1	2	1	2	1	2	13	1	1.4384	1.3216
Jan6								3		1.433	1.433
Jan7							3			1.38	1.38
Jan8							3	11		1.4363	1.4285
Jan9								3		1.433	1.433
Jan10								1	1		1.485
Jan11				1	1	1	1		2	1.480	1.3940
J111						1		1			1.346
J112	2		5	4	3	1	1	2	1	1.096	1.1968
J113		1	2		1	1	1	3	4	9	1.4822
J114					1		2	2	4	1	1.4375
J115	1				3	1	2		3	4	1.4850
J116					1		1	2	1		1.390
J117			1	1					3	1	1.433
C1							2	10	5	1.413	1.4352
C2							1	3	1	1.45	1.4380
C3		1		3	1	9	5	1	1	1.288	1.286
C4						1	1	1			1.336
C5			1						3	1	1.440
IR	1					2	5	5	2	1.309	1.2886

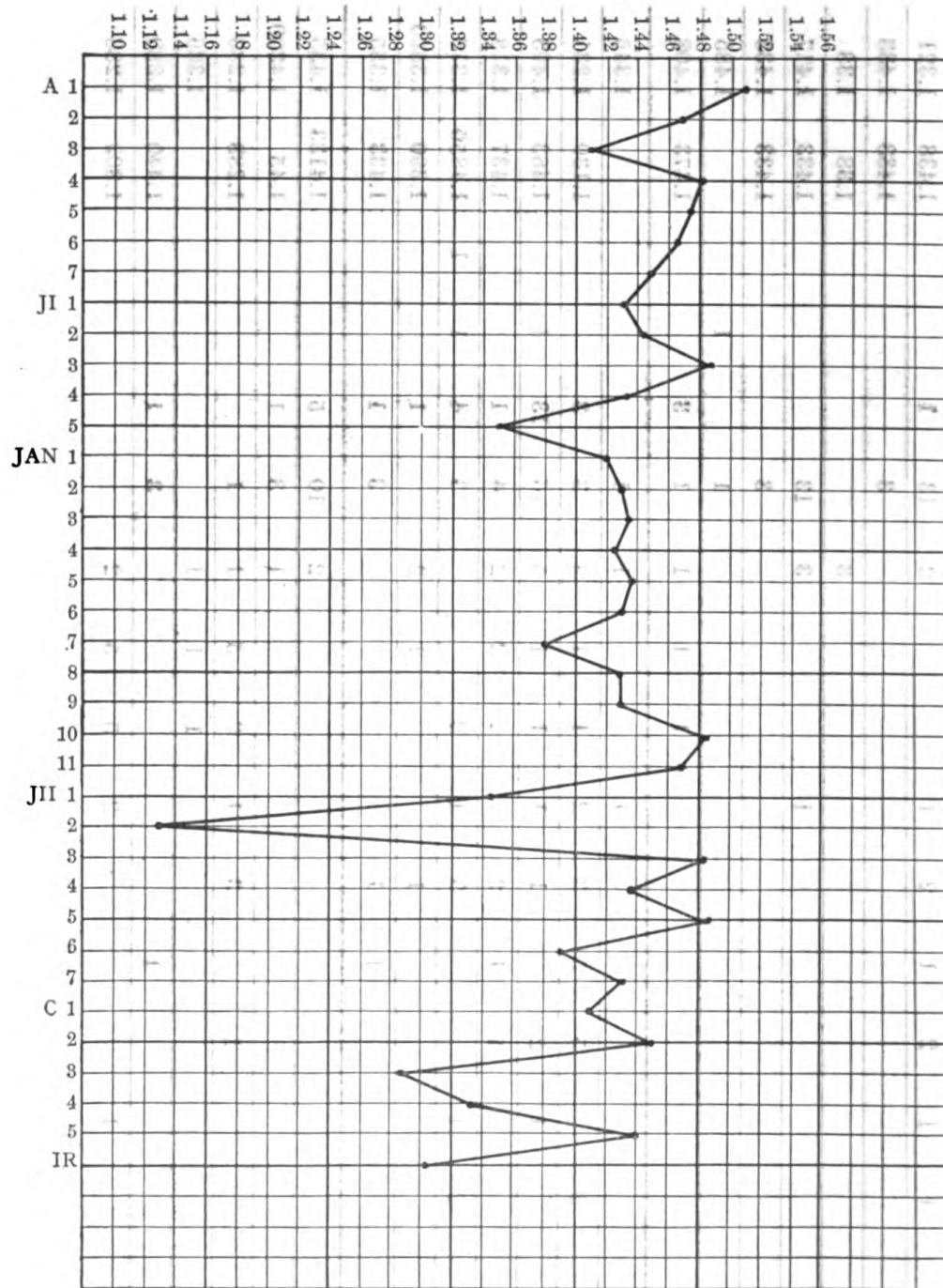


CHART XIa. GRAPH OF CHART XI — AVERAGE WEIGHT  
IN LARGEST WEIGHT GROUP

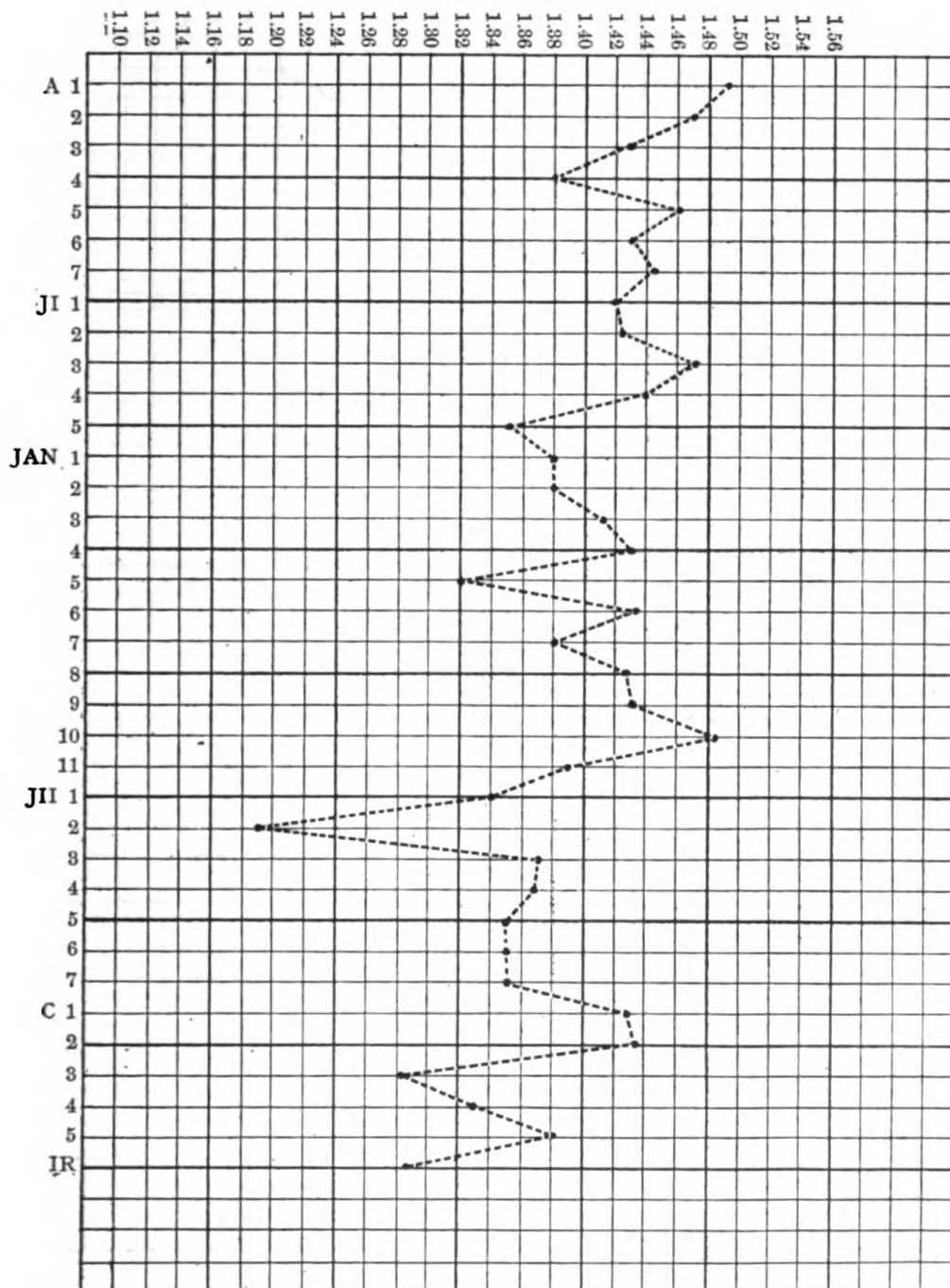


CHART Xb. GRAPH OF CHART X — AVERAGE WEIGHT  
OF ALL SPECIMENS OF KNOWN WEIGHT



## INDEX TO LETTERED PLATES

- PLATE A:**
1. Theodoric Gold Medallion (*BMCVOL*, p. 82, 1)
  2. Anastasius Tremissis (ANS)
  3. Justinian I Tremissis (ANS)
  4. Justin I Tremissis (ANS)
  5. Ostrogothic Anastasius Tremissis (*BMCVOL*, p. 56, nos. 71–72, pl. VII, 3)
  6. Ostrogothic Anastasius Tremissis, HSA 30163.
  7. Justinian Follis, Carthage (?) (ANS, cf. *BMB*, p. 29, nos. 30–31)
  8. Justinian Silver Votive Issue, Carthage after 534 (ANS, cf. *BMCB*, p. 63, nos. 350–354)
  9. Justinian Silver Votive Issue, Carthage after 534 (ANS, cf. *BMCB*, p. 63, nos. 350–354)
- PLATE B:**
1. Visigothic Tremissis, Leovigild, HSA 16002 (Miles 8h)
  2. Visigothic Tremissis, Leovigild, HSA 16000 (Miles 28a)
  3. Visigothic Tremissis, Leovigild, HSA 15984 (Miles 37a)
  4. Visigothic Tremissis, Leovigild (Florez, p. 175)
  5. Visigothic Tremissis, Chindasvinth and Reccesvinth, Seville (Miles 348a)
  6. Visigothic Tremissis, Reccesvinth, Seville (Miles 349)
  7. Visigothic Tremissis, Reccesvinth, Seville (Miles 367a)
  8. Visigothic Tremissis, Reccesvinth, Mérida (Miles 374a)
  9. Visigothic Tremissis, Reccesvinth, Mérida (Miles 374a)
  10. Visigothic Tremissis, Wamba, Seville (Miles 392a)
  11. Visigothic Tremissis, Wamba, Seville (Miles 392c)
  12. Visigothic Tremissis, Wamba, Mérida (Miles 393a)
  13. Visigothic Tremissis, Wamba, Mérida (Miles 393c)
  14. Visigothic Tremissis, Wamba, Mérida (Miles 394a)
- PLATE C:**
1. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 176)
  2. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 177)

3. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 179)
4. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 181)
5. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 181α)
6. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 181γ)
7. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 182)
8. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 183)
9. Zeno Tremissis, Milan (Ulrich-Bansa, pl. XV, 185)
10. Merovingian Tremissis of Theodebert I (Prou, p. 10, no. 38, pl. I, 14)
11. Merovingian Tremissis of Theodebert I (Prou, p. 12, 48, pl. I, 17)
12. Merovingian Tremissis of Childebert I (Prou, p. 9, no. 34, pl. I, 10)
13. Merovingian Tremissis (Prou, pl. I, 18)
14. Merovingian Tremissis (Prou, pl. I, 20)
15. Visigothic Silver Box, late VIth century (Museo Arqueológico Nacional, Madrid)

- PLATE D:**
1. Arcadius Siliqua, Aquileia (Ratto no. 18)
  2. Anastasius Gold Medallion (Ratto no. 308)
  3. Arcadius Siliqua, Rome (Ratto no. 19)
  4. Zorita de los Canes no. 7
  5. Zorita de los Canes no. 1
  6. Zorita de los Canes no. 2
  7. Zorita de los Canes no. 5
  8. Zorita de los Canes no. 4
  9. Zorita de los Canes no. 3

- PLATE E:**
- (a). Visigothic Pilasters, Aljibe del Conventual o Alcazaba de Mérida (Schlunk Photo)
  - (b). Visigothic Chancel fragment, Museo de Mérida.

- PLATE F:** (a) & (b). Visigothic Chancel fragments, Museo de Mérida.

- PLATE G:**
- (a) & (b). Visigothic Cimacios, M. A. Córdoba.
  - (c). Capital with representation of "Sacrifice of Isaac," San Pedro de Nave (Zamora).

- PLATE H: (a). "Glorification of Christ" relief, Santa Maria en Quintanilla de las Viñas (Burgos)  
(b). Relief with "Christ Blessing," S. M. Quintanilla de las Viñas (Burgos)
- PLATE J: Tetramorph Capital with Symbol of St. Mark, M. A. Córdoba.
- PLATE K: Tetramorph Capital with Symbol of St. John, M. A. Córdoba.
- PLATE L: The Prophet Micah, *Biblia Hispalense*, Biblioteca Nacional. Madrid.

## PLATES



A



1



2

3

4

5

6



7



8

9

B



1



3



4



5



AV



2



6



7



8



9



10



11



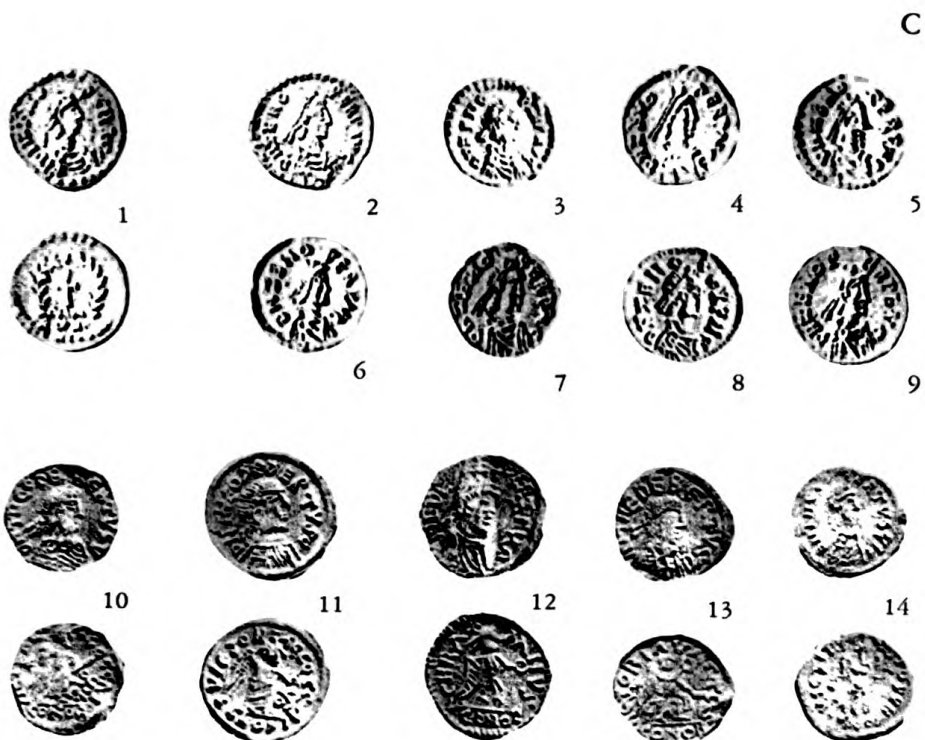
12



13



14



15



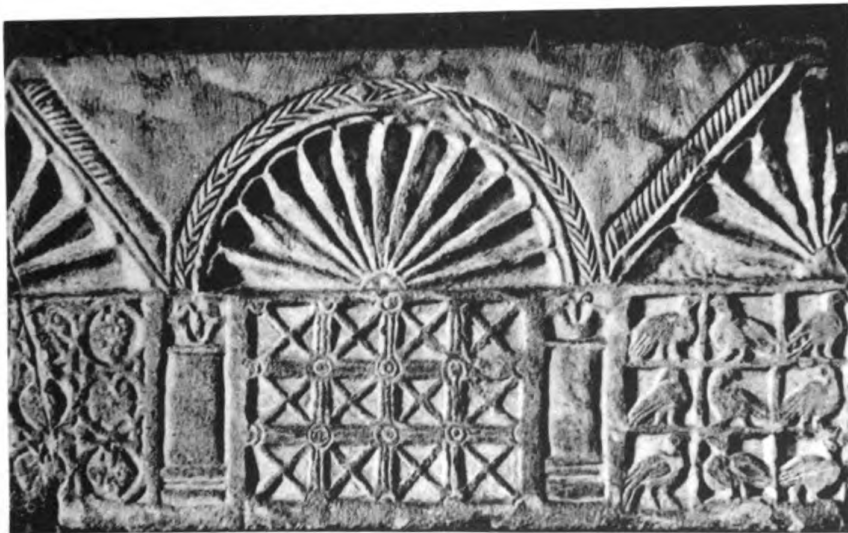
D



E

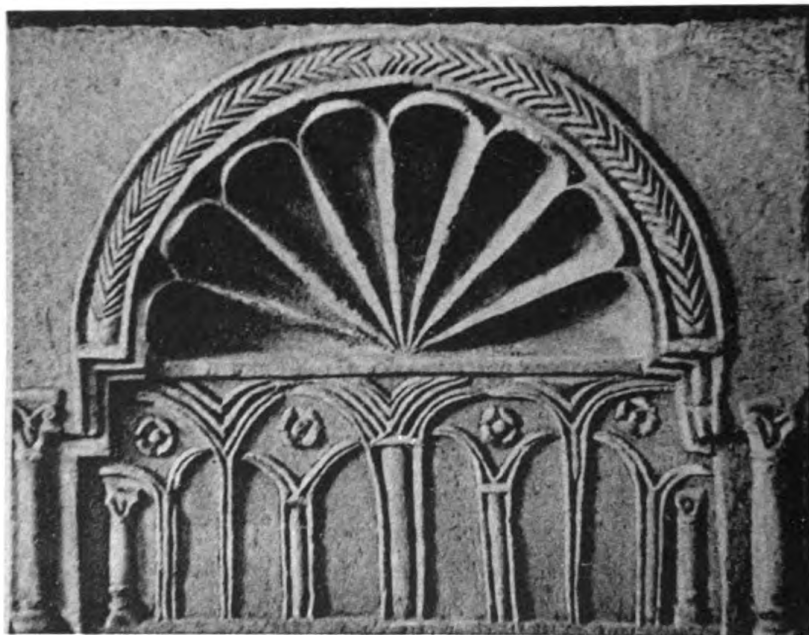


a



b

F



a

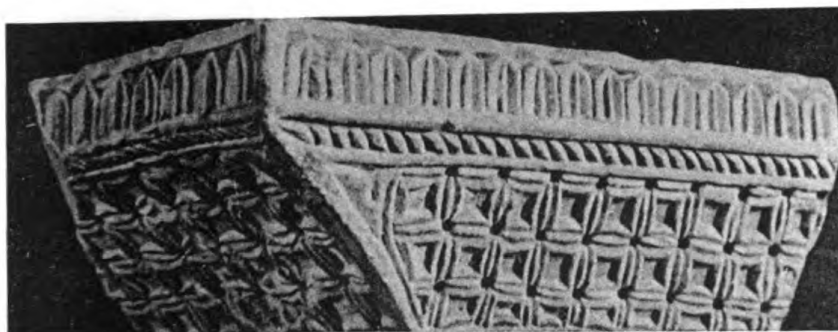


b

G



a



b



c

H



a



b



K

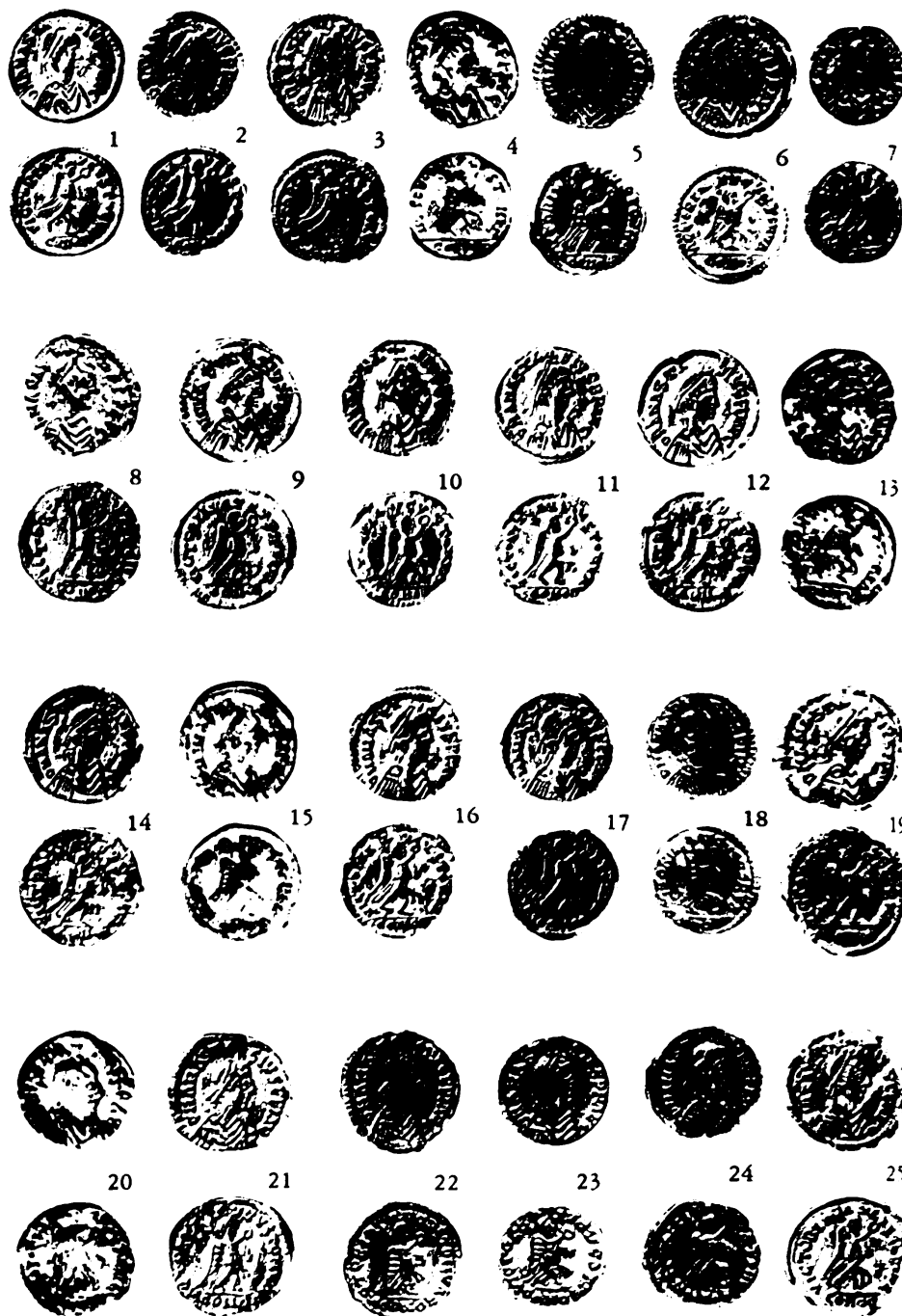






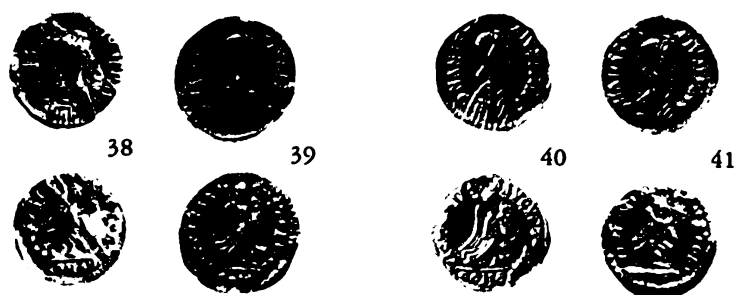
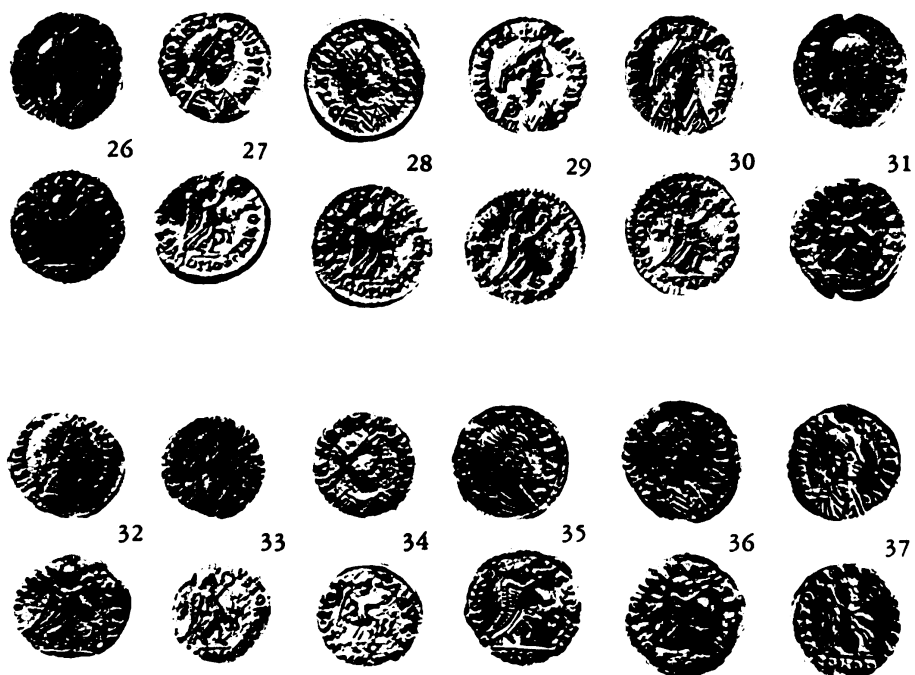


I



ANASTASIUS

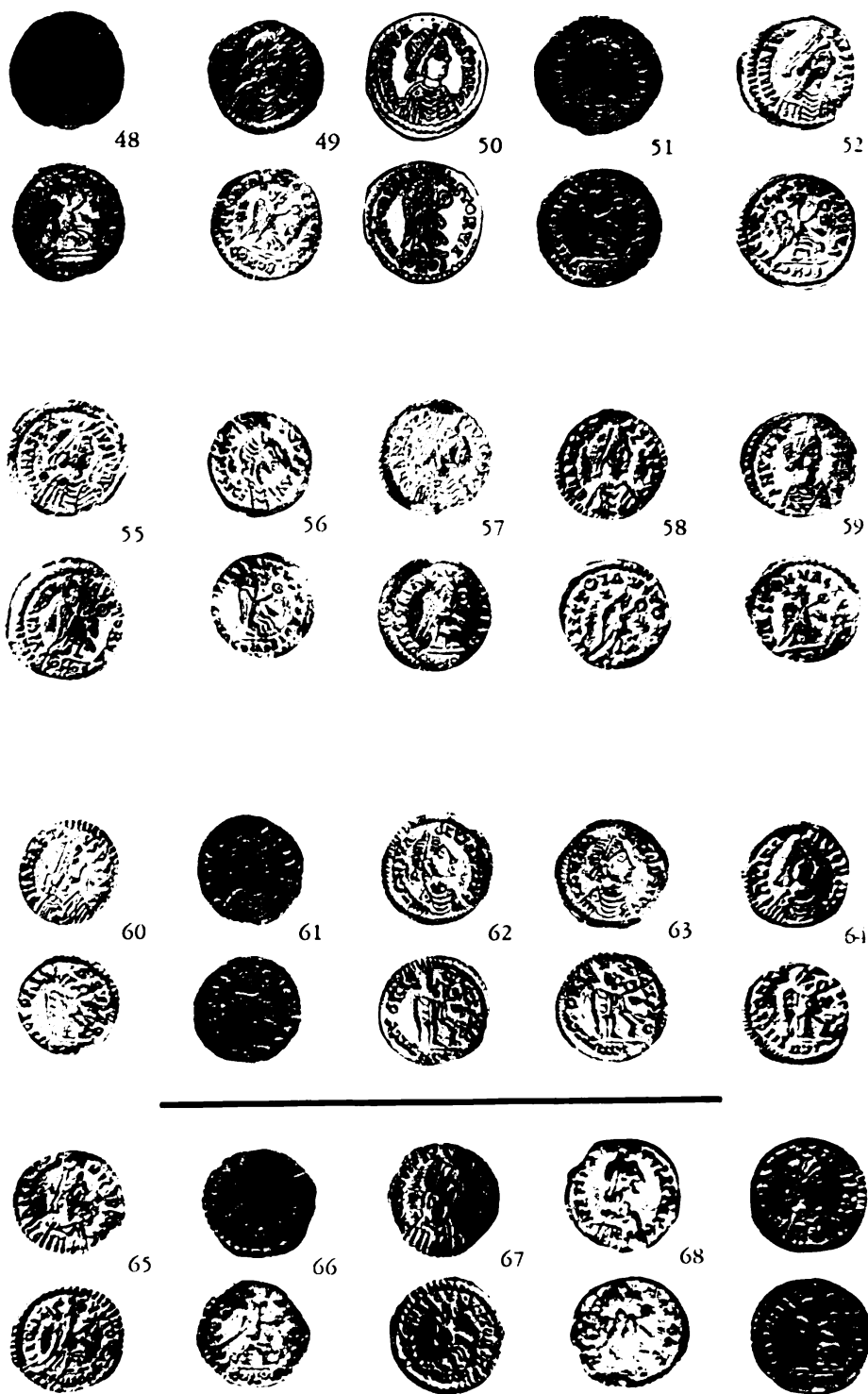
*A 1-A 1a*



ANASTASIUS

*A 1a-A 2a*

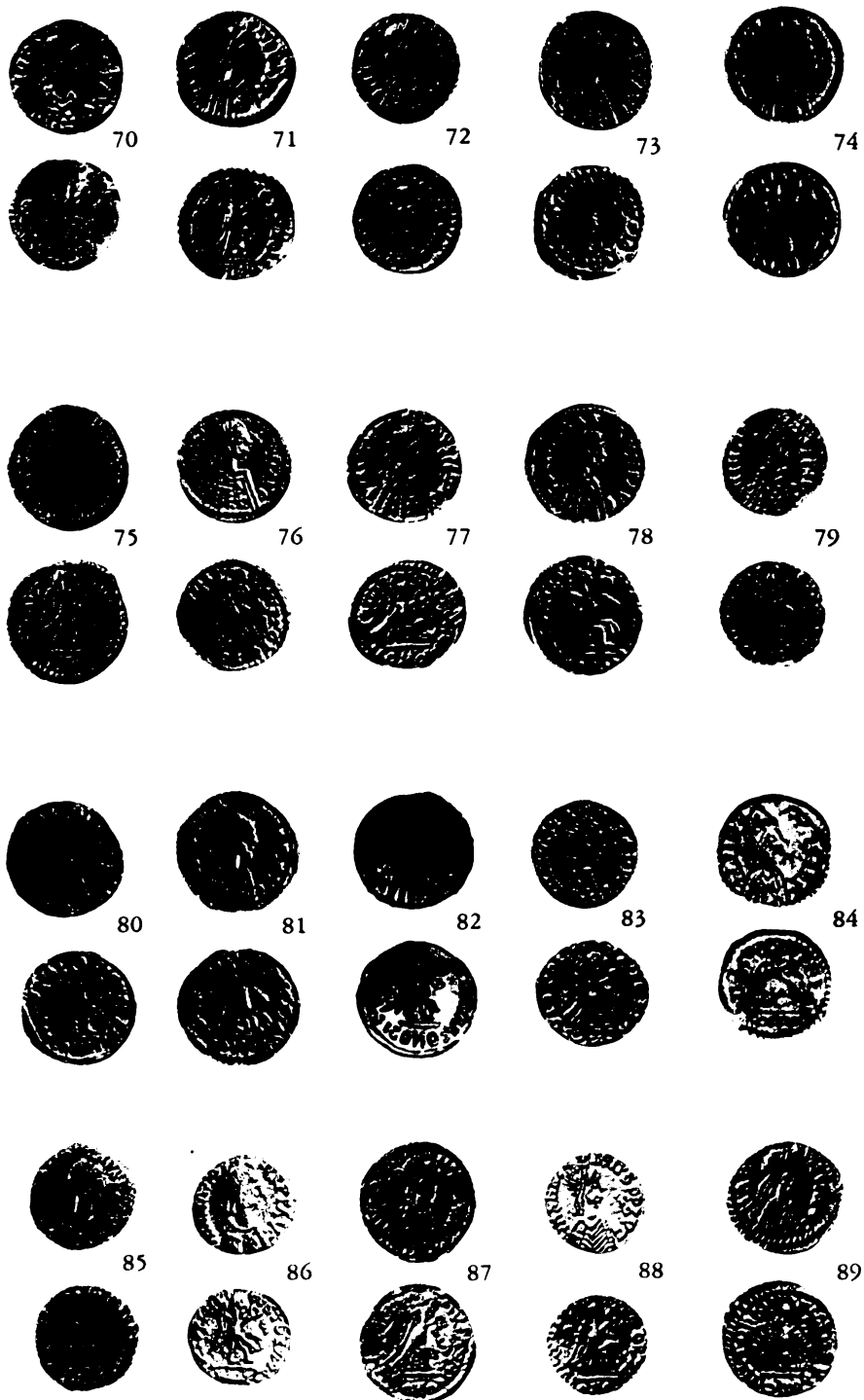
# III



ANASTASIUS

*A 2a-A 3*

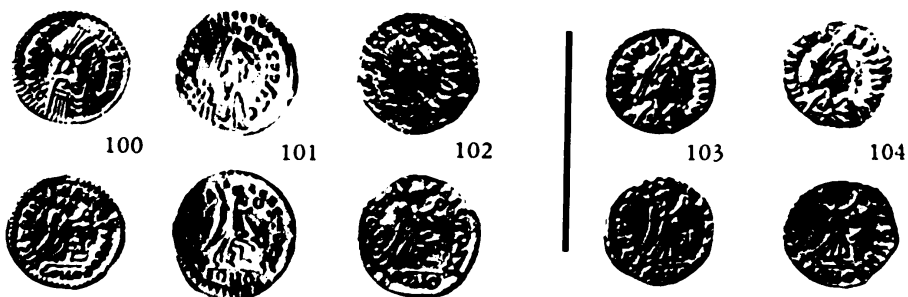
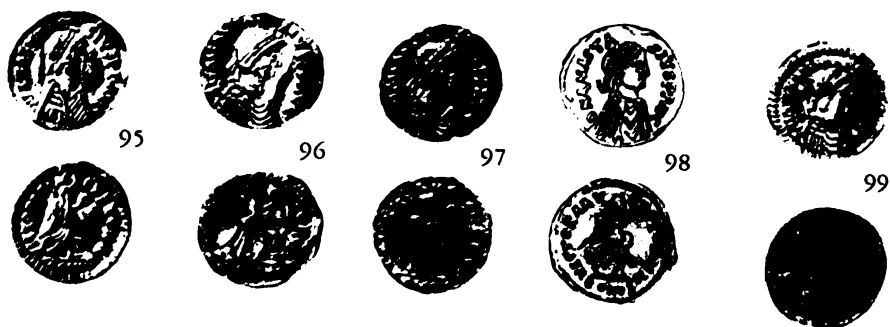
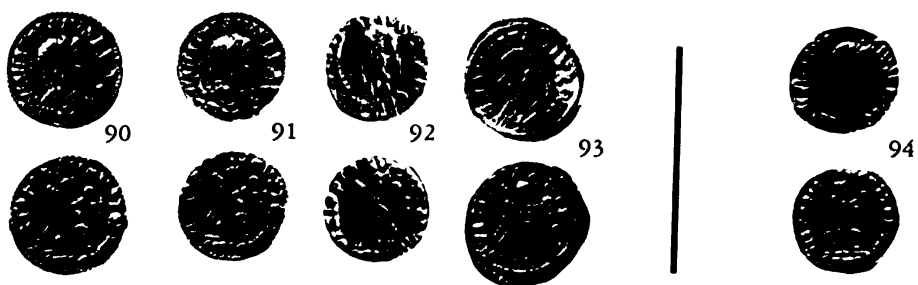
IV



ANASTASIUS

*A 3-A 3c*

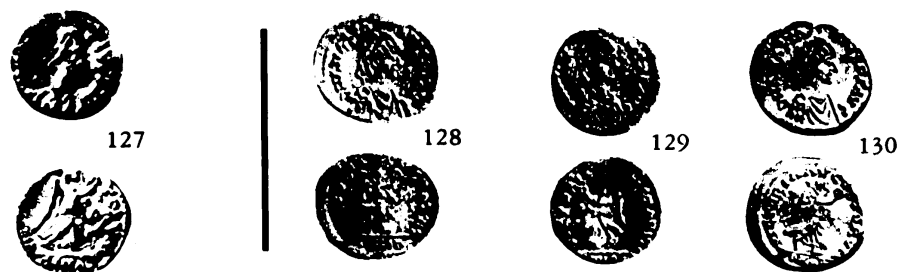
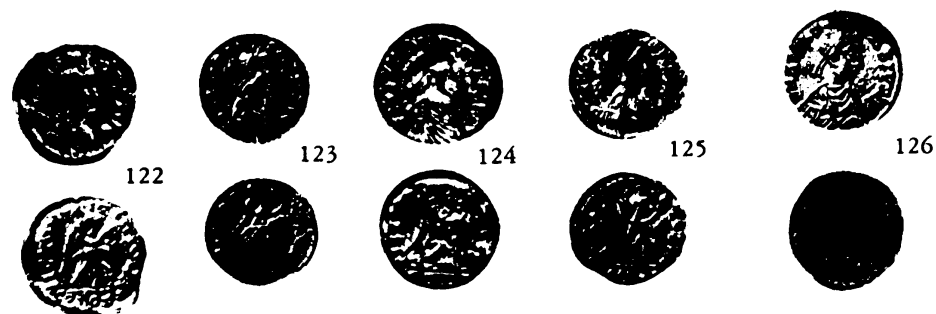
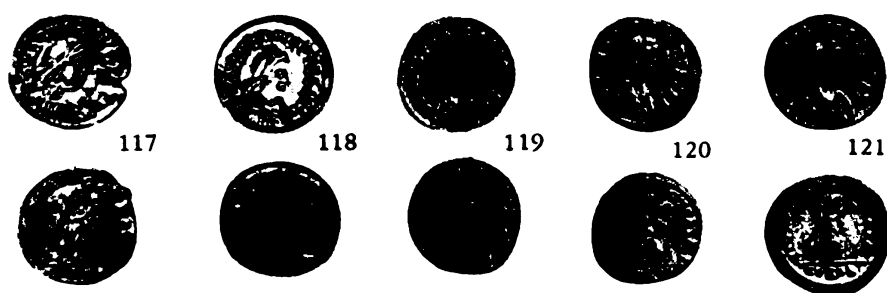
V



ANASTASIUS

*A 3d-A 5*

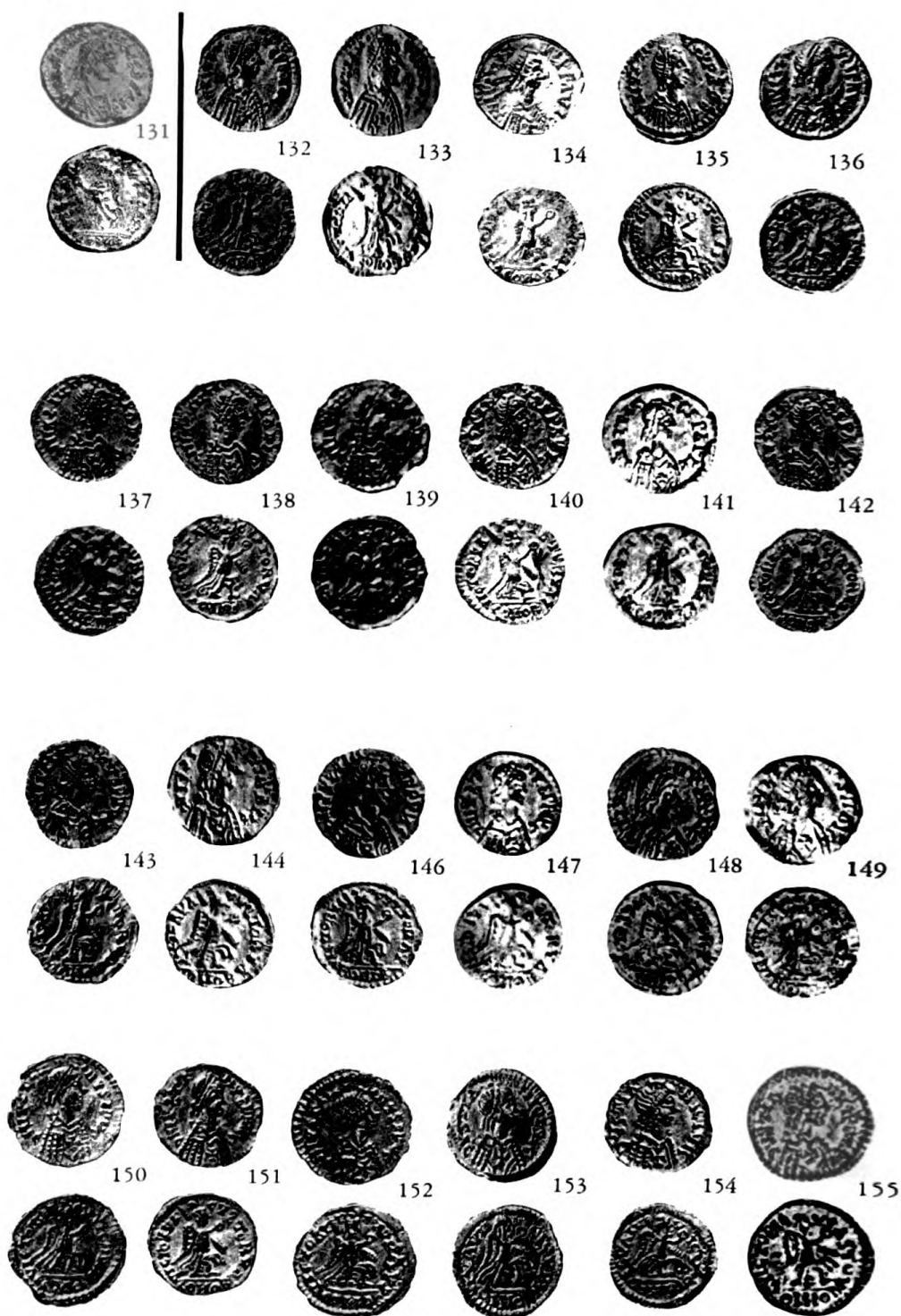
VI



ANASTASIUS

*A 5-A 7*

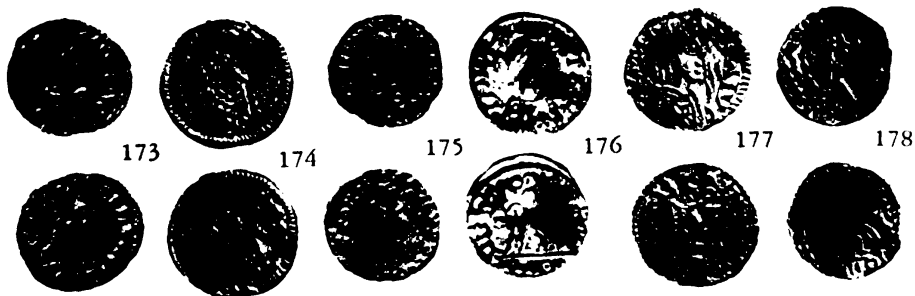
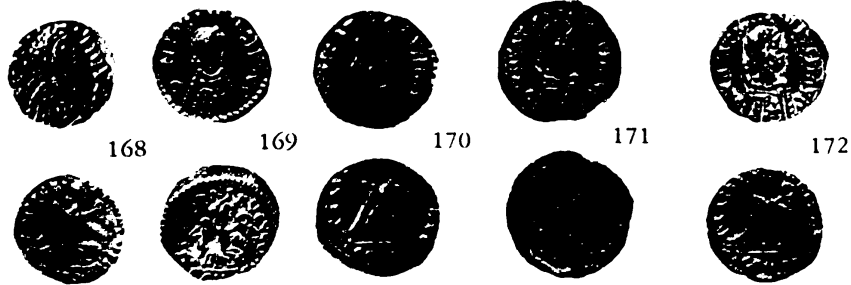
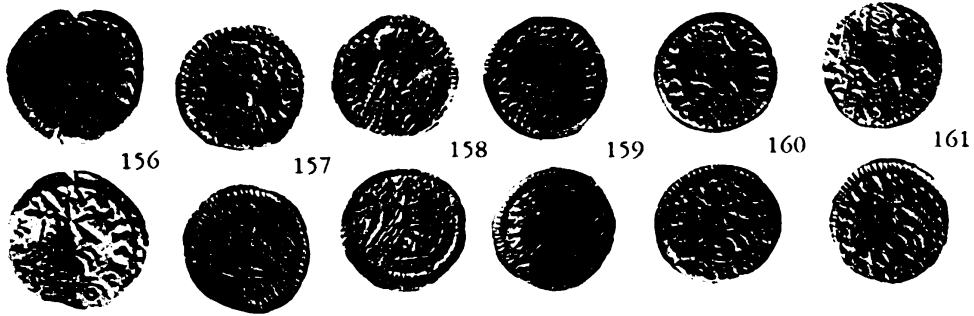
VII



ANASTASIUS — JUSTIN I

*A 7-JI*

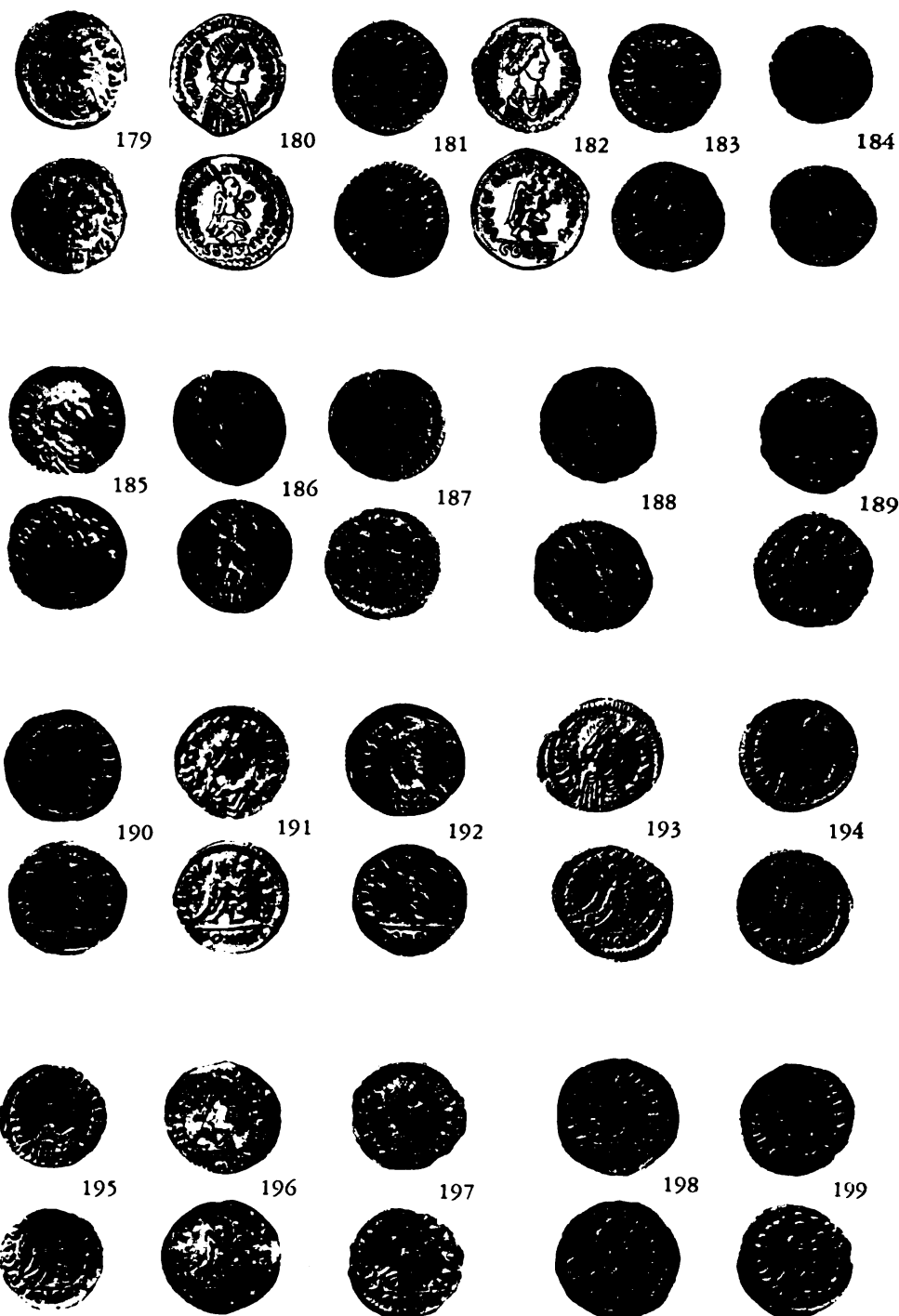
VIII



JUSTIN I  
*JI I-JI th*

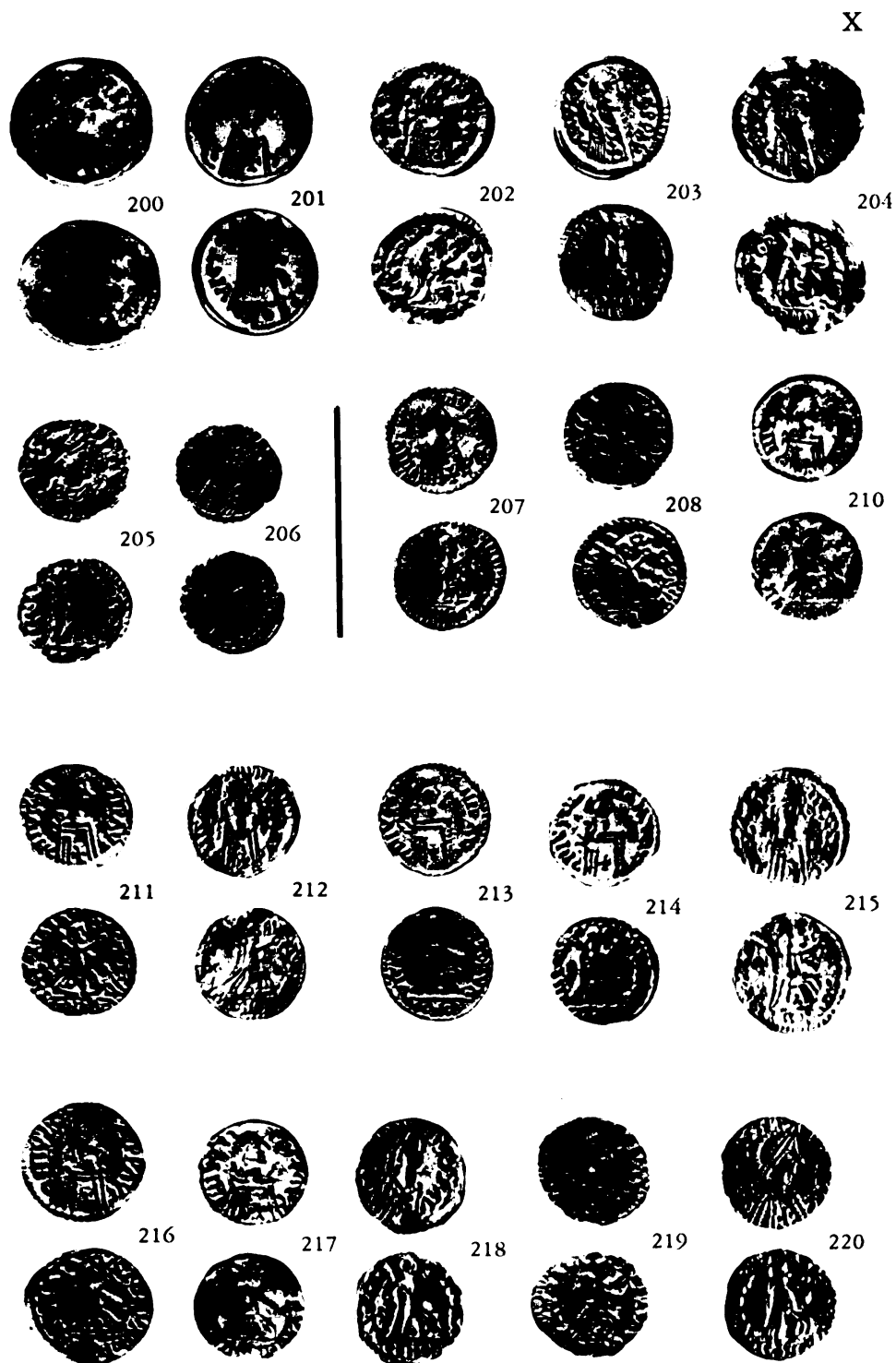


# IX



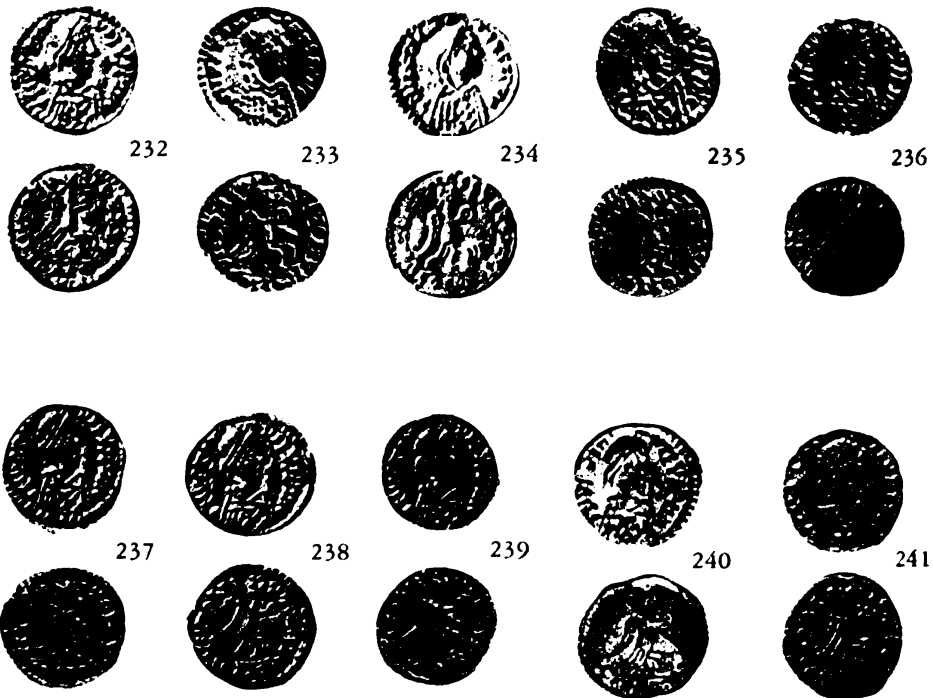
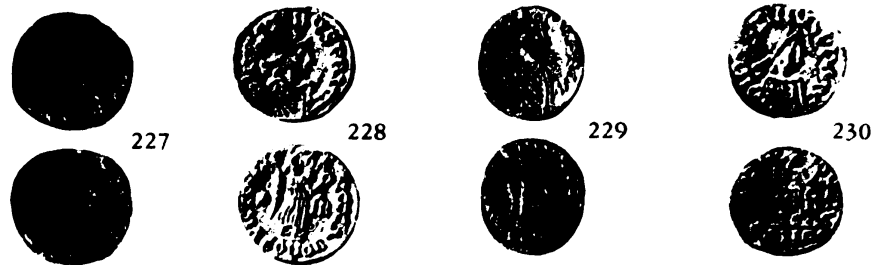
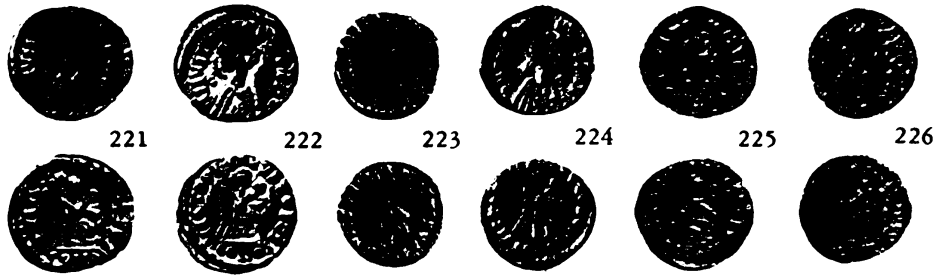
JUSTIN I

*Jl 2*



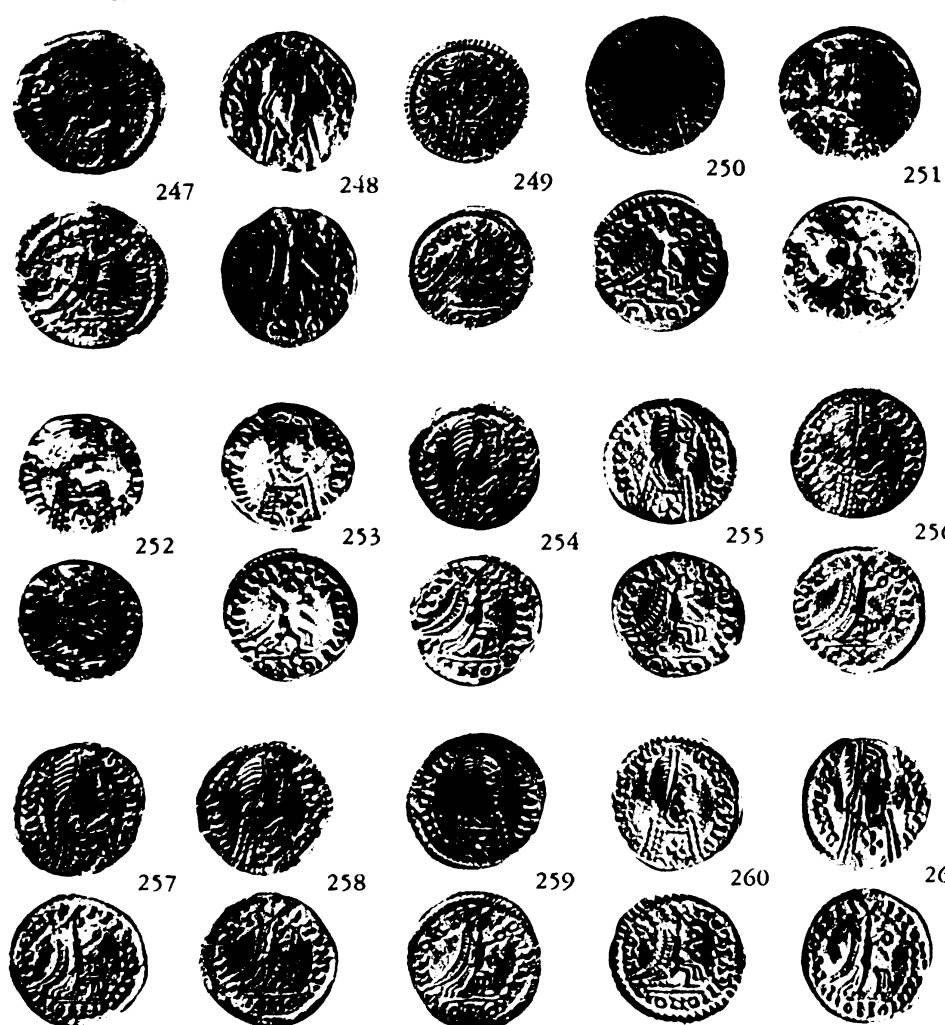
JUSTIN I  
*Jl 2-Jl 3b*

XI



JUSTIN I — JUSTINIAN I

*JI F-JAN I*



JUSTINIAN I  
JAN 1-JAN 2

# XIII



## JUSTINIAN I

*JAN 2*

XIV



JUSTINIAN I

*JAN 2-JAN 2d*

XV



JUSTINIAN I

*JAN 3-JAN 4*



JUSTINIAN I

*JAN + JAN 5*

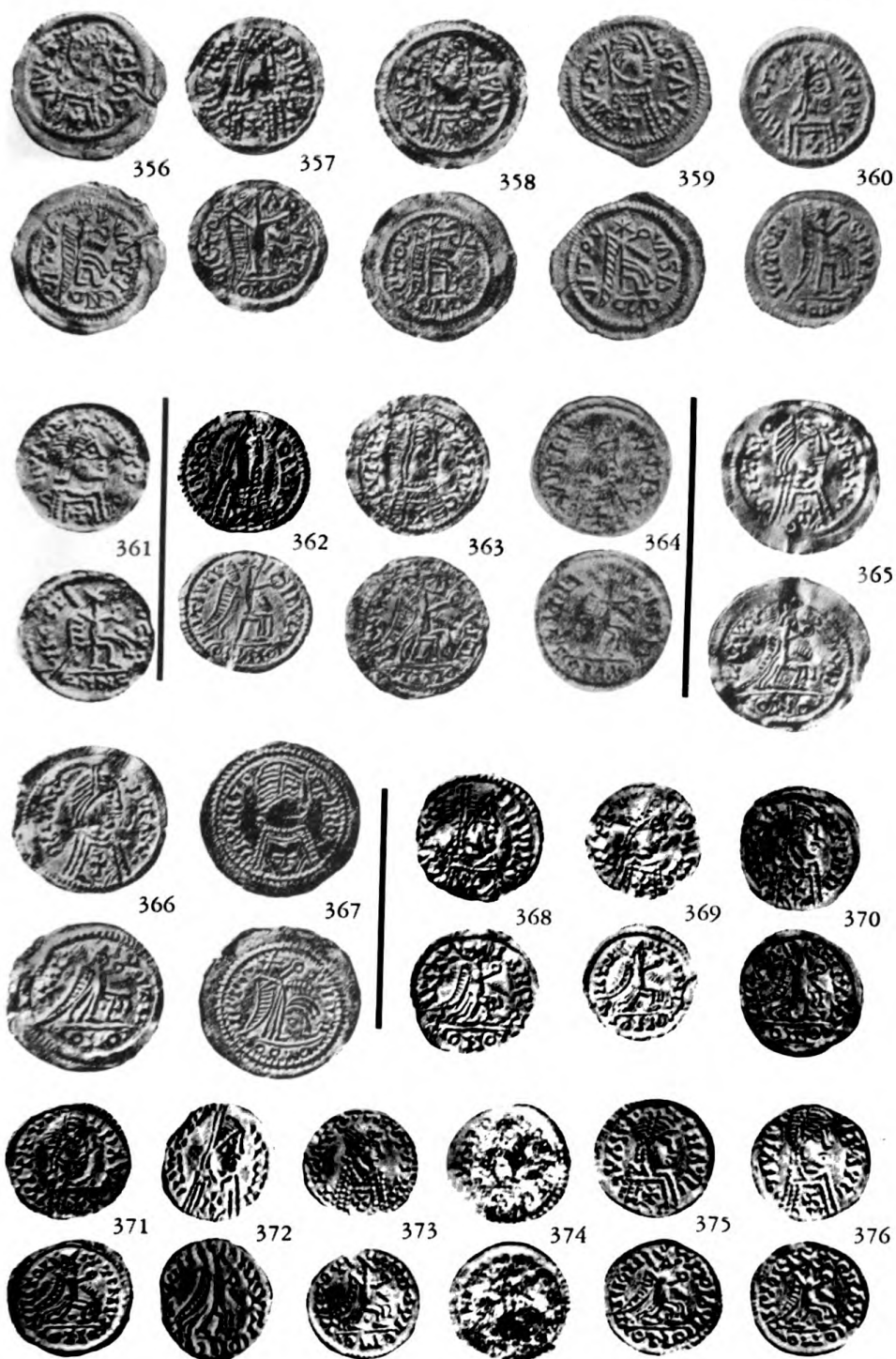


XVII



JUSTINIAN I

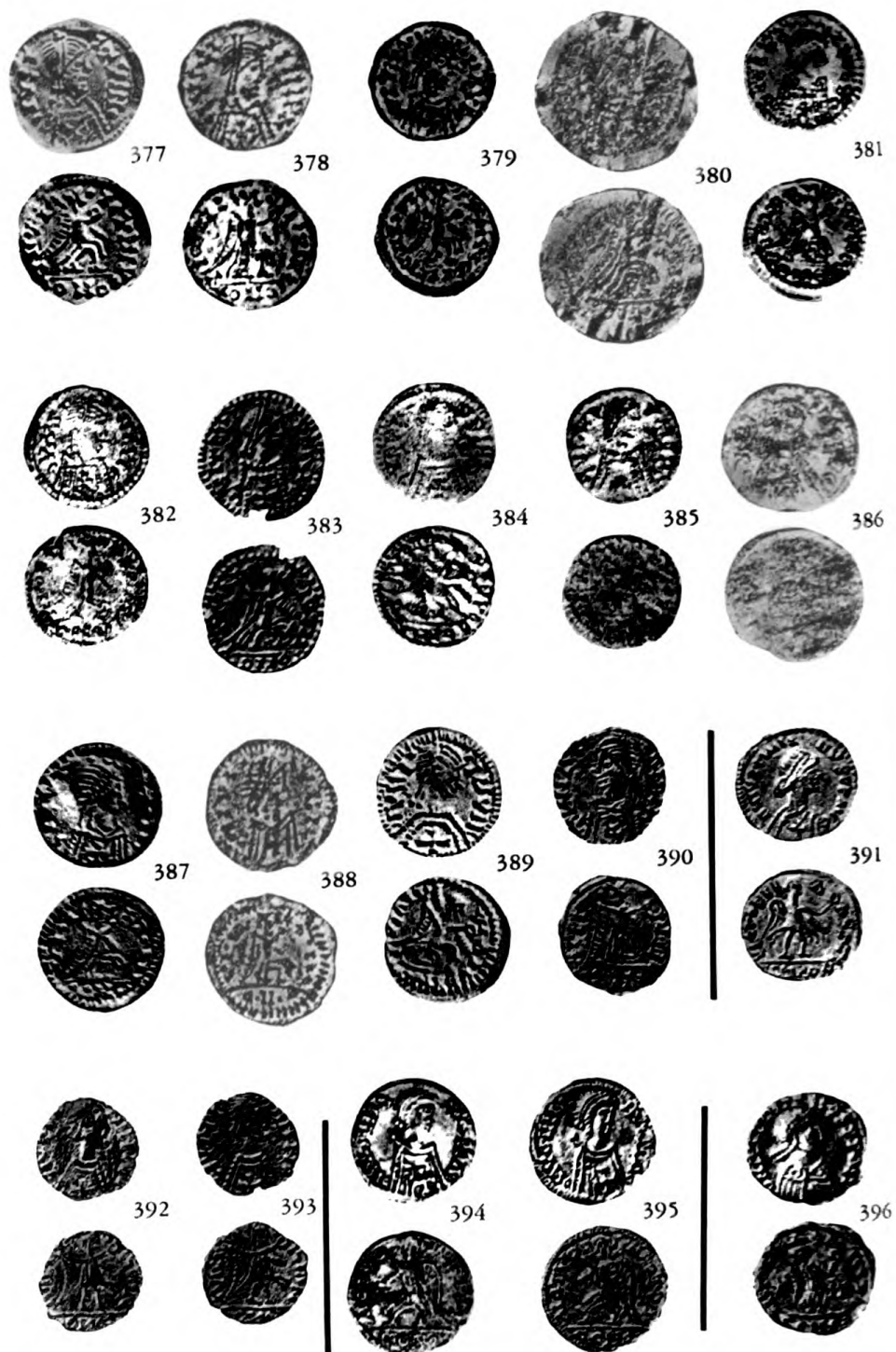
*JAN 5*



JUSTINIAN I

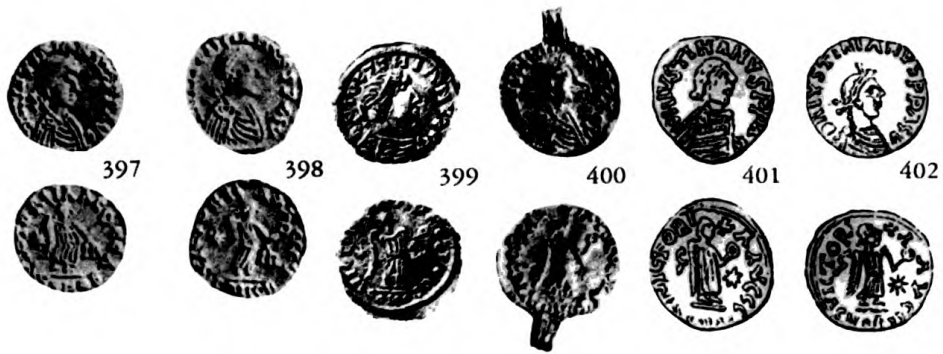
JAN 5-JAN 8

XIX



JUSTINIAN I

*JAN 8-JAN 11*



JUSTINIAN I — JUSTIN II

*JAN II-JII 2*

# XXI



JUSTIN II

*JII 2*





JUSTIN II  
*JII 2-JII 3*

XXIII



JUSTIN II  
*JII 3*

XXIV



JUSTIN II

*JII 3-JII 3a*



XXV



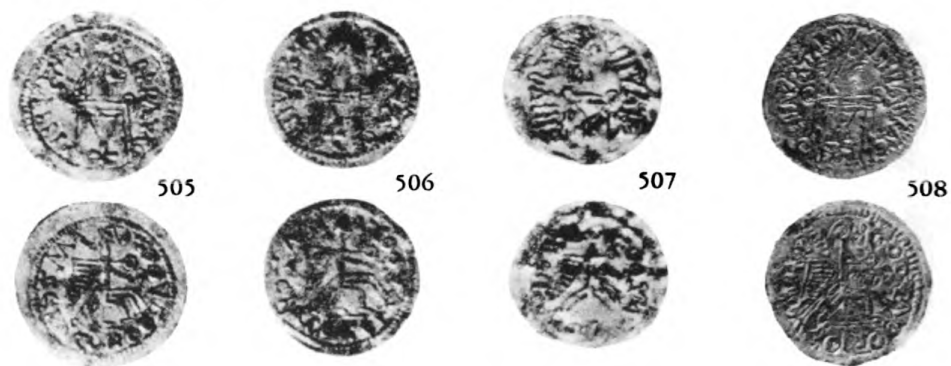
JUSTIN II

*III 3a-III 4*



JUSTIN II  
*JII 4-JII 5*

XXVII



JUSTIN II  
*JII 5*

XXVIII



JUSTIN II

*JII 5-JII 7*

XXIX



JUSTIN II — "CURRU"

*JII 7-C 1*

XXX



“CURRU”

C 1-C 3



XXXI



"CURRU"

C 3

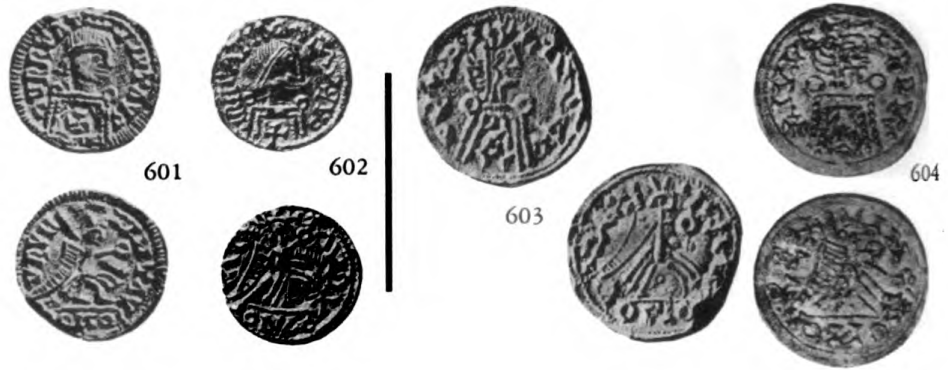


“CURRU”

C 3-C 5



XXXIII



"CURRU" — INCLITUS REX

C 5-I R

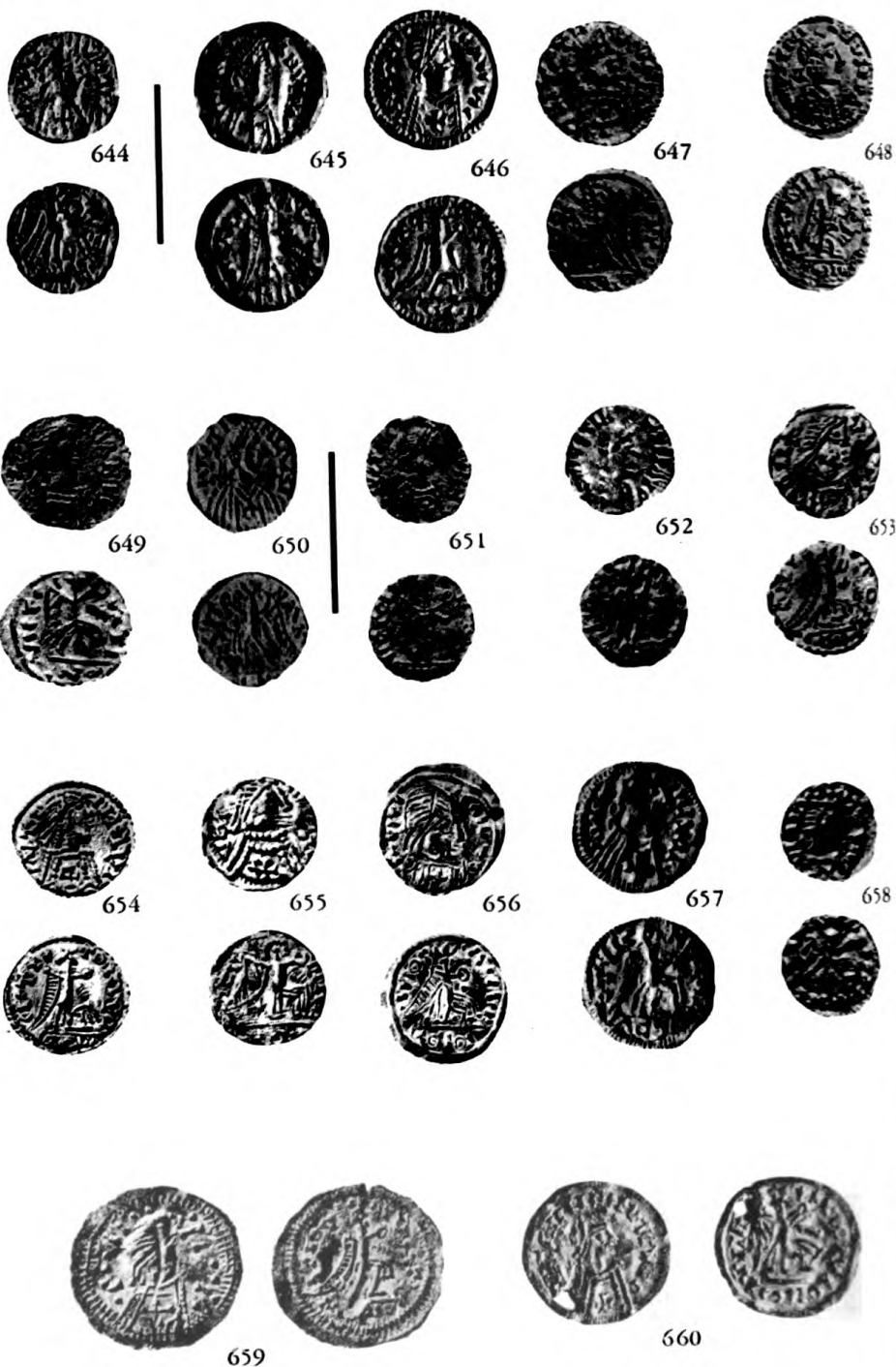


INCLITUS REX — HERMENEGILD

I R-H 4

UNSORTED — ANASTASIUS

XXXV



UNSORTED — ANASTASIUS — JUSTIN I/II

NUMISMATIC NOTES AND MONOGRAPHS

CJ  
35  
N9  
no 153

No. 153

UNIVERSITY  
OF MICHIGAN

AUG 4 1965

LIBRARY

FESTAL AND DATED COINS  
OF THE ROMAN EMPIRE:  
FOUR PAPERS

By ALINE ABAECHERLI BOYCE



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK

1965



# THE AMERICAN NUMISMATIC SOCIETY

*Founded 1858 · Incorporated 1865*

BROADWAY BETWEEN 155TH & 156TH STREETS  
NEW YORK, N. Y., 10032

**PURPOSES:** The Society was founded for the collection and preservation of coins, medals, decorations and paper money and for the investigation of their history and other subjects connected therewith.

**MEMBERSHIP:** Applications for membership are welcomed from all interested in numismatics. Inquiries regarding membership should be addressed to the Secretary of the Society.

**DUES:** The annual dues for an Associate Membership are \$10.00. Issues of the *Notes and Monographs*, *Museum Notes*, *Hispanic Numismatic Series*, and *Numismatic Literature* are distributed to all members.

**PUBLICATIONS:** The *Numismatic Notes and Monographs* consist of separately issued publications, each on a single topic, of which usually several appear each year. *The American Numismatic Society Museum Notes* is a publication, irregular in appearance, consisting of brief notes and papers, principally on items in the Society's collections. *Numismatic Literature* is a quarterly listing current numismatic publications with abstracts of their content. *Numismatic Studies* is a series accommodating works in a larger format. The *Hispanic Numismatic Series*, published in cooperation with the Hispanic Society of America, consists of publications devoted to the coinage of the Iberian Peninsula, and is based on the collections of the Hispanic Society.

**MUSEUM:** The Society maintains a museum located in uptown Manhattan, New York City, which houses its offices, collections and library. Collections embrace coins of all periods from their inception to modern times, medals and decorations. Selections from its cabinets are on display in an exhibition. The library, consisting of about 20,000 volumes, covers all branches of numismatics.

The museum is open to Members and the public on Tuesdays, Wednesdays, Thursdays, Fridays and Saturdays. It is closed on Sundays and Mondays and the following holidays: New Year's Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Election Day, Thanksgiving Day and Christmas Day. The hours of the Library are from 9 A.M. to 5 P.M. The public exhibition is open from 10 A.M. to 5 P.M.

# NUMISMATIC NOTES AND MONOGRAPHS

*Number 153*



# Festal and Dated Coins of the Roman Empire: Four Papers

By ALINE ABAECHERLI BOYCE



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK  
1965



67  
· NO  
11.15.3

**ALL RIGHTS RESERVED BY  
THE AMERICAN NUMISMATIC SOCIETY**

**PRINTED IN GERMANY  
AT J. J. AUGUSTIN · GLÜCKSTADT**

TO  
G. K. B.



## TABLE OF CONTENTS

<b>PREFACE</b> .....	<b>ix</b>
<b>THE PAPERS</b>	
<b>A NEW AUGUSTAN AUREUS OF 17 B.C.</b> .....	<b>I</b>
<b>THE DATED COINS OF POMPEIOPOLIS</b> .....	<b>12</b>
<b>THE NINTH CONSULSHIP OF DIOCLETIAN AND THE CONSULAR         REVERSE</b> .....	<b>22</b>
<b>A NEW SOLIDUS OF THEODOSIUS II AND OTHER VOTA SOLIDI         OF THE PERIOD</b> .....	<b>40</b>
<b>KEY TO PLATES AND TEXT</b> .....	<b>91</b>
<b>PLATES</b> .....	<b>103</b>



## PREFACE

These studies were undertaken with the express intention of publishing outstanding accessions along with related coins already in the collections at the American Numismatic Society. The four papers appearing in this volume, the basic work for which was completed before 1955, were written in the conviction that noteworthy accessions ought to share the limelight of publication with pertinent coins already resting in the trays of a museum's collection. The papers are in this sense similar to some of the articles I have published in the *American Numismatic Society Museum Notes*.

Each study seeks to examine an outstanding coin or an outstanding group of coins in a general numismatic and historical background, without any claim or pretense to finality with reference to any coin or conclusion. Specifically, this group of papers deals with rare gold pieces of three Roman emperors—Augustus, Diocletian, and Theodosius II, and with dated coins struck under the Roman Empire for a Cilician city founded by Pompey the Great. The Augustan aureus did not come to the Museum of the American Numismatic Society and is now in private hands. It was examined and studied at the Museum, however, and has been the reason for the publication of related silver pieces in the collections, since it illuminates the whole series to which both gold and silver belong.

My thanks are due the following: L. C. West, for encouraging the pursuit of studies in the coinage of the Roman world, imperial and local, from the early days of my association with the Museum of the American Numismatic Society; S. P. Noe, for calling attention to pertinent items concerning the Romans which came to his attention; Charles L. Morley, for permitting me to publish the beautiful Augustan aureus; E. Gans, who provided a denarius of Domitia for photographing; Frederick Knobloch, for allowing me to publish a coin of Geta; Malcolm Hunt, for providing me with a list of his PONTIF COS II issues of Geta (his arrangement was generally the same as mine); R. A. G. Carson, for casts of two consular aurei as

well as of the handsome consular solidus of Theodosius II and the solidus of Licinia Eudoxia, all in the BM; A. Suhle, for casts of a fine consular aureus of Maximian; L. R. Taylor, for help in obtaining a photograph of the Augustan secular *acta* and officials of the Museo Nazionale delle Terme for permission to publish it.

I am also indebted to officials of the following institutions for sending me casts or photographs of the coins of Pompeiopolis in their collections: the Cabinet des Médailles (J. Babelon, and Monique Mainjonet for supplementary information), Bibliothèque Nationale, Paris; The British Museum (R. A. G. Carson and G. K. Jenkins); the Ashmolean Museum, Oxford (C. Kraay); the Fitzwilliam Museum, Cambridge (H. T. Shrubbs); the Hunterian Museum, Glasgow (Anne Robertson); the coin cabinets in the national museums at Copenhagen (G. Galster); Munich, including the Gotha Collection (Dr. Christ); Vienna (K. Pink); and Istanbul (N. Dolunay and C. Ar-tuk). From Berlin (A. Suhle) I have received a full descriptive list of the Pompeiopolitan coins in the Münzkabinett, and K. Kraft has kindly produced for me casts of specimens at Frankfurt and Tübingen. In addition M. Henri Seyrig sent me casts of a fine Severan piece at the American University in Beirut. The following collectors have generously made their coins available for photographing or have sent casts or descriptions: H. von Aulock, L. Cancio, T. O. Mabbott and D. Stephens.

For the use of its facilities a word of thanks is due the University of Michigan Library, and special appreciation is owed to the library staff of the American Numismatic Society for making available material not immediately accessible to me. Finally, thanks are due the Publication Committee and the Editor and his staff for valuable suggestions and for seeing a complicated manuscript through the press.

## A NEW AUGUSTAN AUREUS OF 17 B.C.<sup>1</sup>

In recent years there have been a number of articles on the grouping into *collegia* and on the chronological arrangement of the Augustan moneyers whose names appeared on the Roman imperial coinage in the last two decades of the first century B.C. This article is of another sort; its chief purpose is to present a combination of obverse and reverse types known to have been struck by the moneyer M. Sanquinius in silver but appearing now for the first time in gold (PLATE I, 1). The new aureus adds a chapter to the history of the one college of the Augustan moneyers which struck coins in all metals—gold, silver and bronze. The existence of the coin proves that each of the two varieties of denarii struck by Sanquinius was matched by a corresponding variety in gold; and its discovery leads to a reconsideration of the meaning of the coins in the Augustan age.

In 1947 H. Mattingly published an article "Vergil's Fourth Eclogue,"<sup>2</sup> and among the photographs used to illustrate it he included one of the coin described in *BMCEmp.* I, p. 13, 69, pl. 2, 19, the aureus of M. Sanquinius which shows a young male head surmounted by a star and a flame, or, if one puts the two elements together, by a comet. In *BMCEmp.* I, Mattingly, following convention,<sup>3</sup> had called this head "Julius Caesar deified," the comet evidently being a reference to the comet that had appeared in the course of the *Ludi Victoriae Caesaris* of 44 B.C., giving Octavian an excuse to place this symbol on statues of Caesar.<sup>4</sup> But in the list of coins for his article

<sup>1</sup> The historical importance of the series to which this aureus belongs has been emphasized in such articles as C.H.V. Sutherland's "Senatorial Gold and Silver Coinage of 16 B.C.," *NC* 1943, pp. 40-49, and F. Panvini Rosati's "Le emissioni in oro e argento dei 'Tresviri monetales' di Augusto," *Arch. Class.* 3 (Rome, 1951), pp. 66-85.

<sup>2</sup> "Virgil's Fourth Eclogue," *Journ. of the Warburg and Courtauld Institutes*, 10 (1947), pp. 14-19.

<sup>3</sup> Eckhel, *Doctr. Num.* 6, pp. 11-12 (*Div. Iul.*); cf. 6, p. 102 and 5, pp. 299-300; Babelon, *Monn. Rép. Rom.* II, pp. 417-18; Cohen (*Jul. Caes. and Oct. 1*); Grueber, *BMCREp.* II, p. 78.

<sup>4</sup> Pliny, *NH* 2, 94; cf. Suet. *Div. Iul.* 88; Dio, 45, 7, 1; Zonaras, 10, 13; Servius on Verg. *Ecl.* IX, 47.



on *Eclogue* IV Mattingly showed that he had progressed to the idea that this head might be that of the young Iulus (Ascanius), son of Caesar's proclaimed ancestor Aeneas. The flame in this case was evidently to be considered a reference to the portent of the flame on the head of Iulus in *Aeneid* II, 679–704, which had led, after the appearance of a comet, to Aeneas' departure from burning Troy, and ultimately, to the founding of Rome centuries later. A double reference, to the deification of Caesar and to Caesar's ancestor Iulus, seems not impossible, but an interpretation of the cometed head as that of Iulus has long appealed to me as being more consistent with the young head.<sup>5</sup> Both interpretations, to be sure, fit not only the flame over the star but also the occasion for which the coins were struck. As the legend **AVGVST DIVI F LVDOS SAE** and the herald's figure on the other side of the aurei and denarii bearing this head show (PLATE I, 2, 3), these coins of M. Sanquinius were struck for the year of the Augustan *Ludi Saeculares*—17 B.C.,<sup>6</sup> just a short time after the death of Vergil, poet and propagandist of the Augustan

<sup>5</sup> Cf. the deification (baby on globe surrounded by stars) of **DIVVS CAESAR IMP DOMITIANI F** (PLATE I, 6; see *BMCEmp.* II, p. 311, 62–3, *N*, *R*; cf. p. 347, 246), and issues of M. Aurelius for Diva Faustina the Younger, *BMC Emp.* IV, pp. 655–6 and Jupiter, as Defender of the Emperor's *Salus*, surrounded by seven stars on the bronze coins of Commodus, *BMCEmp.* IV, p. 833, 679 (pl. 109, 14).

<sup>6</sup> On the correctness of this dating see particularly Panvini Rosati, *op. cit.*, pp. 76f.; on p. 71, however, he fails to note that Max v. Bahrfeldt in his *Die Römische Goldmünzenprägung während der Republik und unter Augustus* (Halle, 1923), p. 148, really dated the aureus with the herald of the Secular Games in 17, not in 15 B.C. (see n. 18 of this paper). The herald is a figure similar to the one on the coins of Domitian (PLATE I, 7, 8) struck for the Secular Games of A.D. 88, but Domitian's herald carries a simple wand, not a caduceus. Grueber, *BMCRep.* II, p. 78, n. 1, discusses the type at length.

The importance of the coinage of the moneyers of 17 B.C. in imperial policy is brought out by Sutherland in an article on the moneyers of the following year (*op. cit.*, p. 42). Dated coins of Mescinius **TR POT IIX (=VIII)** June 27, 16 B.C. June 26, 15 B.C., *BMCEmp.* I, p. 16, 85, *N*, cf. 89, *R* referring to the *Ludi* (Augustus distributing *suffimenta* and a cippus inscribed **IMP/CAES/AVG/LVD/SAEC**; to l. and r. **XV** and **SF**, dated **TR POT** only) commemorate the erection and dedication of the cippus on which was recorded the official account of the festival. If L. Vinicius was the first moneyer to coin in 16 B.C. (Panvini Rosati, *op. cit.*, p. 70, n. 1), then Mescinius might well have been issuing his coins close to the anniversary of the *Ludi* of June, 17 B.C. Just as his issues may be regarded as commemorative, so Sanquinius' herald type may be said to have been anticipatory of the games (cf. *BMCEmp.* I, p. 74, 431).

regime. Vergil had told the story of Iulus and the portentous flame followed by a comet. Not only were both Julius Caesar and Iulus associated with a comet, but in the very year of the Secular Games a comet was reported to have been seen.<sup>7</sup> Whom, then, does this head indeed represent? The arguments from literature on behalf of the deified Julius are indeed very strong (see n. 4) and they are further strengthened by Augustan coins (*BMCEmp.* I, pl. 6, 6–8 and pl. 7, 9) which bear the head of Augustus on obverse and star with flame and legend *DIVVS IVLIVS* on reverse, and also, it may be argued, by the coins struck under Tiberius in honor of Divus Augustus, with a star (but no flame) on the top of this head. But whereas these coins have legends defining the type, the youthful bust on the coins of Sanquinius is given no legend defining either portrait or comet.<sup>8</sup> The youthful quality of this head on Sanquinius' coins is the chief difficulty in identifying it with Caesar as Eckhel (*Doctr. Num.* 5, pp. 290–300) evidently felt, and it has been explained as symbolizing a rejuvenation of Caesar that went with his deification. Perhaps it is a matter of no importance where a question of deification is involved, but lack of any certain resemblance to Caesar on the specimens I have seen is as troublesome to me as the frequently youthful character of the head. It is the young head which brings Ascanius or Iulus into consideration. But the interpretation of the head as Iulus seems to me too particular, too piecemeal for the magnificence and grandeur of the *Ludi Saeculares* and the idea of a New Age which they symbolized. And one cannot fail to compare the indefinite and changing quality of this bust's features with the head of Honos on the rare

<sup>7</sup> Julius Obsequens, *Liber Prodigiorum*, ed. O. Rossbach, 1910, 71 (131). We must, I suppose, consider the possibility that this story of the comet arose as a result of the coin types on which a comet appeared.

<sup>8</sup> It may be significant that the legend *AVGVSTVS DIVI F* (the legend which soon, incidentally, came to dominate the gold and silver imperial coinage for the rest of Augustus' reign) appears not *with* this head but on the herald's side of the coin, and with Augustus' head on the variant reverse. Augustus' descent from the divine Julius is associated with the cometed head, then, only by suggestion, not by a clear definition of the head. The coinage gives the impression of a build-up for the divinity of Augustus himself, as does the consistent use of *AVGVSTVS DIVI F* on the gold and silver coinage for most of the rest of his reign; cf. the use of the star in front of the head of Octavian *DIVI F* on the large sestertii which bear on their reverses a laurel wreath encircling *DIVOS IVLIVS* (PLATE I, 4).

aureus of the Augustan moneyer M. Durmius, which is attended by two stars, one in front, one behind (*BMCEmp.* I, pl. 2, 8; Bahrfeldt; *Röm. Goldmünzenpräg.*, p. 142), a quality which suggests that the head is not a portrait.

There is yet something more to add by way of interpretation. New light may be sought from Pliny the Elder, who is one of the authorities (see n. 4) for the appearance of a comet shortly after Caesar's death (*NH* 2, 93-4). Pliny puts his account of the appearance of the *sidus Iulium* into words which he reports as Augustus' own. If we read the whole of Pliny's statement we note that before and after quoting Augustus he speaks of the comet in relation to Augustus himself:

"In but one place in the whole world a comet is an object of cult,—at a temple in Rome. (*Cometes in uno totius orbis colitur in templo Romae.*) The divine Augustus considered this comet wholly propitious to himself (*admodum faustus Divo Augusto iudicatus ab ipso*). For it appeared at the beginning of his reign during the games which he gave in honor of Venus Genetrix shortly after the death of his father Caesar, under the management of a college of priests which he had established. In fact, he made known his joy in the following words: 'At the very season of my games [the *Ludi Victoriae Caesaris*] a comet (*sidus crinitum*) was seen in the North for seven days. It used to rise about the eleventh hour of the day and was bright and visible from all lands. The common people believed that the star meant that the spirit of Caesar had been received among the *numina* of the immortal gods and for this reason it was added as a symbol to the likeness of Caesar's head (*simulacro capitis eius*) which we shortly thereafter dedicated in the Forum.' These were the words he made public; but within his own heart he rejoiced because he deemed the comet to have appeared for his own sake and believed that he had been born under its influence (*interiore gaudio sibi illum natum seque in eo nasci interpretatus est*). And to tell the truth, it *was* beneficial to the world."

It is clear that in this passage the story of Caesar's comet is set within a framework of reference to Augustus himself, for at the beginning and end of it Pliny is speaking of Augustus' concept of Caesar's comet, its importance for him and his rule. The comet worshipped is said to have been in a temple at Rome (*colitur in templo*

*Romae*). The comet placed on Caesar's head and consecrated *in foro* may well have been a separate honor paid to the phenomenon. There were several such statues of Caesar in Rome (see n. 9). In a subsequent passage (*NH* 2, 98) Pliny speaks of some sort of celestial phenomenon which attended Octavian's entrance into Rome after Caesar's death. Vergil goes beyond this. On the shield he describes as having been fashioned by Vulcan for Aeneas (*Aeneid* VIII, 680–681), Octavian himself is represented at the Battle of Actium with flames and the *sidus Iulium* on his head. In *Aeneid* I, 286ff., moreover, Jupiter foretells that the fame of the Trojan Caesar (Augustus), Julius descendant of Iulus, will reach the stars and that with his victories wars will cease and law will prevail. Two decades earlier in fact Vergil in *Eclogue* IX, 46–50, had identified this comet with a time of prosperity, clearly the time of the present Octavian and the future Augustus. Commenting on these lines Servius Danielis, on the authority of a certain Baebius Macer, states that certain people thought the phenomenon, a *stella amplissima, quasi lemniscis, radiis coronata*, was intended to reveal the *gloria* of Caesar's heir, while the young Octavian himself said the portent signified the *anima* of his father, Julius Caesar, and placed a statue surmounted by a golden star *in Capitolio*, inscribing on the base, CAESARI EMITHEO. In the same Commentary a third opinion is then cited, that of the haruspex Vulcanius. Without relating it to any individual, Vulcanius publicly pronounced the celestial phenomenon to be a comet which signified the end of the ninth *saeculum* and the beginning of the tenth. It matters little that Vulcanius, as the story is told, having betrayed divine secret lore, foresaw his own immediate death and dropped dead before he had finished speaking. The importance of this story for us is that he had associated the comet with a new age. The memoirs of Augustus himself, specifically Book II, are given as authority for the story. The inconsistency of Augustus' attitude toward the comet as quoted and interpreted by Pliny and as related in the Servian commentary perhaps finds explanation in Pliny's reference to Augustus' public pronouncement and private feelings. Augustus, moreover, may have expressed himself differently at the time of the actual appearance of the comet and in his memoirs written much later. In any case, the identification of the comet with a new

age in both sources is the crucial theme. The same concept is reflected in the comment of Servius Danielis on *Aeneid* X. 272: *hic [cometes] dicitur apparuisse eo tempore quo est Augustus sortitus imperium; tunc denique gaudia omnibus gentibus futura sunt nuntiata*, "it [this comet] is said to have appeared at the time when Augustus took over the supreme power; then at last tidings of great joy would come to all nations." Obviously, then, celestial lore was associated with Augustus as well as with Julius Caesar, who had received it mainly through Augustus' efforts.<sup>9</sup> A transfer of emphasis from Caesar to Augustus was simple and suited the times. Much had transpired between 44 and 17 B.C. From Pliny's words we can see that the comet was something more than a symbol of a deified ancestor or a ruler seeking deification. For the comet had earned deification in its own right. By reappearing at the time of the *Ludi Saeculares*, moreover, the comet became the symbol of the inauguration of the New Age. Hence it appears (in the form of a star) on the herald's shield (*BMCEmp.* I, pl. 2, 20; on our examples it shows up best on the plated piece, PLATE I, 3). It is then possible that the cometed head represented something more than an ancestor of the Julian House, more than Divus Julius, more than Augustus seeking deification. Unidentifiable as this young cometed bust seems, may it not be the New Age itself, the *Saeculum*, or to put it in characteristic Roman terms, the *Genius* of the *Ludi Saeculares*,<sup>10</sup> phenomenally brought into being by the

<sup>9</sup> A statue of Caesar surmounted by the *sidus Iulium* was erected by Octavian in the Temple of Venus [Genetrix], Dio, 45, 7; for these statues in general see Suet. *Iul.* 88; Serv. on *Aen.* VIII, 681. Augustus' role in making propaganda of the comet becomes clearer when contrasted with the different interpretation of a later age, pointed out in one paragraph of R. S. Rogers' "The Neronian Comets," *TAPA* 84 (1953), pp. 242-3. For a recent discussion of the literature (non-numismatic) on the *sidus Iulium* and the importance of Octavian's utilization of it ("an event which symbolically commenced a new era of general faith in astrology in the West") see F. H. Cramer, *Astrology in Roman Law and Politics*, The American Philosophical Society, Philadelphia, 1954, pp. 78-80.

<sup>10</sup> Cf. the Severan figure of the *Saeculum Frugiferum*, radiate, and bearing caduceus and trident (*BMCEmp.* V, p. 20, 4: pl. 5, 18) and the figure of the Genius of the Circus on the rare aureus of Hadrian (*BMCEmp.* III, pl. 53, 5) which celebrates the 874th anniversary of the traditional birthday of Rome. Cf. also the discussion of *Aion*, P. Graindor, *Rev. Belge de phil. et d'hist.* I (1922), pp. 440-43 and C. Cichorius, *Röm. Stud.*, 187f.

That the types of Sanquinius have more to do with Augustus himself than is apparent, and with the celebration of the present *saeculum* as an institution

appearance of a comet in the year of the festival? In this case we need not look for precise identification of a portrait. If it is at all possible that the child in Vergil's *Eclogue* IV was symbolic of a New Age,<sup>11</sup> then in 17 B.C., when the idea of a new age had fully matured and become widely known through the great poets, we may have not Caesar, not Iulus, not merely Augustus, but the Augustan *Saeculum* symbolized by the Genius of the Comet which is itself deity and everlasting: *sunt qui et haec sidera perpetua esse credant*, are Pliny's very next words!<sup>12</sup> If Augustus believed, as Pliny states, that he was

---

of his own, may be suggested in the fact that the herald carries a caduceus and may have been intended to suggest Augustus himself as the messenger of the new age (*BMCEmp.* I, p. civ; cf. the Augustan *Acta Saecularia*, ll. 25-8), since he was identified with another messenger, the god Mercury (e. g., in Horace, *Odes* I, 2, 43; see also K. Scott, "Mercury on the Bologna Altar," *Röm. Mitt.* 50 [1935], 225-30). One reason for attaching special significance here is that the herald on Domitian's coins for the Secular Games of A.D. 88 carries a simple wand (PLATE I, 7-8), not a caduceus. We have noted above that the caduceus appears in the hand of the Severan *Saeculum Frugiferum*, where the combination of legend and type makes clear the notion of prosperity implicit in the concept of the new age. Against identification of Augustus with the secular herald may be the evidence of the Augustan secular type, *BMCEmp.* I, p. 74, 431, if the figure opposite the herald represents Augustus.

On the comet as a symbol of the New Age (but not with reference to the coins of 17 B.C.), see L. R. Taylor, *Divinity of the Roman Emperor*, pp. 91-2; cf. H. Wagenvoort, "Vergils vierte Ekloge und das Sidus Iulium," *Mededeel. der Koninkl. Akad. van Wetenschappen Amsterdam Afd. Letterk.*, Deel 67 (1929), pp. 18-21, 35, where the coins are mentioned only generally in an otherwise brilliantly analytical paper, which, incidentally, agrees with our interpretation of Pliny, *NH* 2, 93-4.

<sup>11</sup> See L. R. Taylor, *op. cit.*, pp. 112-15 and 176, and n. 23, p. 113, with a statement of indebtedness to E. Norden's *Die Geburt des Kindes* (Leipzig, 1924). Cf. the recent analysis of I. S. Ryberg, "Vergil's Golden Age," *TAPA* 89 (1958), p. 116, n. 15.

<sup>12</sup> The star that can be seen on the herald's shield may be a symbolic reference to the Augustan saeculum. The star is clear on some specimens, not obvious on others, and perhaps was not engraved in all dies. The story in Dio, 54, 29, 8, relating to the appearance of a comet for several days at the time of Agrippa's death in 12 B.C., and the denarius of the *flamen Martialis*, L. Lentulus (*BMCEmp.* I, pl. 4, 14), which shows a statuary group (?) in which Augustus, identified by the *clipeus virtutis* CV, places a star on the head of a heroic or god-like figure bearing a Victory (PLATE I, 5: Divius Julius, not Agrippa, and the *flamen Martialis*, L. Lentulus, not Augustus according to Gsell, Babelon, and more recently, J. Gagé, *Actes, Congr. Intern. Numism.* 1953, Paris, 1957, pp. 219-227) suggest the progress of Augustus' use of celestial

"born in this comet" (*seque in eo nasci*), then little could be more true of this "unidentifiable portrait" than that it was meant to represent the new Saeculum identified with Augustus and his comet: the Augustan Age.

Identification of Augustus and his successors with a new age or with stars is a concept appearing in imperial literature, as A. Alföldi has demonstrated in "Der Neue Weltherrscher der IV Ekloge Vergils," *Hermes* 65 (1930), p. 381. Professor Alföldi quotes passages from literature in which various emperors (Augustus, Claudius, Vespasian, Nerva, Domitian) are identified with a new age and/or stars (cf. PLATE I, 4, 6).<sup>13</sup> This sort of identification may well have been intended on the coins of Sanquinius, for the features of the cometed head frequently resemble those of Augustus on coins of Sanquinius which have on one side, instead of herald of the games, a head of Augustus. It would not in any case be surprising to find similarity of feature between a portrait of Augustus and another bust which had to be imagined by the artist.

It has long been known that the type of the young cometed head was struck in combination with the type of the secular herald on both aurei and denarii (PLATE I, 2, 3, denarii only; for aurei see

---

symbolism and indicate that he took for granted at least similar honors for himself. On gold and some of the beautiful bronze pieces struck for Divus Augustus by Tiberius, the first Princeps as Divus Augustus Pater is represented with a star (not a comet) on his head. On the bronze the head is radiate, and in front of it is a thunderbolt, signs of divinity unknown to any coinage struck for the divine Julius but steadily being prepared for the use of his heir from the time of Julius Caesar's death. The star as a symbol of divine quality had long before appeared in such positions as on the caps of the Dioscuri and at the diadem ends of Hellenistic kings.

<sup>13</sup> A comet was certainly a more spectacular symbol for use as propaganda than a star, but stars were always available, while no ruler could count on a comet to make its appearance for his convenience. It is therefore not surprising that the stars continued to appear on the coinage for purposes of imperial propaganda, while the comet disappeared. It need not be added that a comet was sometimes regarded as a baleful, rather than a propitious symbol (e. g. Verg., *Georg.* I, 487 f; see also n. 9 above).

I have not considered it necessary to discuss all the coins earlier than the coins of Sanquinius on which the *sidus Iulium* may have been represented. These may be found, along with an Appendix of literary sources in A. De Schodt's "Le Sidus Iulium sur des monnaies frappées après la mort de César," *Rev. Belge de Num.* 43, pp. 329-403.

*BMCEmp.* I, p. 13, pl. 2, 19). But the variety which combines the cometed head with the head of Augustus has been known only from denarii. So far as I know, the herald type was not combined with the head of Augustus. Unless there should come to light bona fide coins (i. e., not hybrids) combining the herald type with the head of Augustus, this cometed head is the predominant type of the issue.<sup>14</sup> It is Sanquinius' chief obverse, taking precedence over the herald and the portrait of Augustus. The latter might therefore seem to have taken a strangely subordinate position in the issue. But we must remember that the cometed head is on the moneyer's side of the coin and may be considered for this reason his official badge. And the head of Augustus does not seem in a strangely subordinate position if the cometed head transcends the human form that we see beneath the comet and represents the Genius of the Festival, the Saeculum itself, a figure perhaps chosen by Sanquinius as the chief type of his coins because his year was the year of the New Age. Whomever or whatever this bust represents, it was conspicuously connected with the year of the Secular Games of 17 B.C., and it must be identified in the light of this connection and its predominant position on the coinage of Sanquinius. It might even be supposed that the type was a silent tribute to Vergil and the influence of his portents of comet and flames—no earlier or later coins show star with flame, a *sidus crinitum*. It was Vergil who had helped to make the comet a symbol of the destiny of the Julian House, and who, dying in 19 B.C., his work unfinished, had missed by a short stretch of time the public glorification of the new age for which he had written so much over the

<sup>14</sup> Table illustrating the predominance of the cometed head among the gold and silver types of Sanquinius:

	<i>Cometed Head</i>	<i>Herald</i>	<i>Head of Augustus</i>
occurs with:	2 <i>A</i> types:	1 <i>A</i> type:	1 <i>A</i> type:
	Herald	Cometed Head	Cometed Head
	Head of Augustus		
	2 <i>R</i> types:	1 <i>R</i> type:	1 <i>R</i> type:
	Herald	Cometed Head	Cometed Head
	Head of Augustus		
Totals	4	2	2



years.<sup>15</sup> In any case, the comet type was propaganda for the power of Augustus and his house.<sup>16</sup> A number of scholars, including Hardy (*The Monumentum Ancyranum*, Oxford, 1923, p. 104), Stuart Jones (*The Cambridge Ancient History*, 10, p. 150), Sutherland ("The Senatorial Gold and Silver Coinage of 16 B.C.," *NC* 1943, p. 42) and Grant (*Roman Anniversary Issues*, Cambridge, 1950, pp. 19, 163) have pointed out that the games took place ten years after the title of *Augustus* had been conferred. Whether or not this was coincidental or meaningful, it was an important year and an important event which the coins of Sanquinus celebrated. As with other moneyers' types, the types chosen were allotted on the one hand to an event, on the other to the chief "mover" of the event, the Princeps.

Coins were struck in all metals by the moneyers of 17 B.C., an unprecedented action, and one not repeated by any other Augustan *collegium*. Mattingly has already said (*BMCEmp.* I, p. xcvi) that this was perhaps in honor of the *Ludi Saeculares*. A more restrictive statement can be made here: that the only Augustan moneyer who can safely be said to have coined in the three metals was M. Sanquinus. He must have been the chief moneyer of 17 B.C. and more than an ordinary chief moneyer. This is why he issued the most significant coins of the year, the aurei and denarii for the *Ludi Saeculares*.

Aurei to match the denarii of the "herald" issue have long been known. But no aurei to match the denarius with the cometed head on one side and the head of Augustus on the other seem to have been listed. Such an aureus has now come to light, tending to support Pink's theory that one may safely postulate such pieces as seem to be

<sup>15</sup> *Eclogue* IV, 5, 52; *Eclogue* IX, 46-50; *Georgics* I, 498-501; *Aeneid* I, 286-94; *Aeneid* VI, 788-800. With *Eclogue* IV, 6 and *Aeneid* VI, 793-4 cf. *Aeneid* VIII, 324-5, a description of the Age of Saturn.

<sup>16</sup> Passages from Vergil in which flames or stars betoken the destiny of the house of Aeneas are—Flames upon the head: of Ascanius, *Aeneid* II, 679-700. Lavinia, *Aeneid* VII, 71-80. Aeneas, *Aeneid* X, 270-5. Stars or Comet: of Aeneas, *Aeneid* I, 257-60; *Aeneid* X, 270-5; *Aeneid* XII, 794-5 (cf. XII, 166-7). Ascanius, *Aeneid* II, 679-700; *Aeneid* IX, 641-2. Descendants of Aeneas, *Aeneid* III, 258-9. The Latin name through their blood, *Aeneid* VII, 98-101, 270-2. Octavian (Augustus), *Eclogue* IX, 46-50, through the *Caesaris astrum* (cf. Horace, *Iulium sidus*, *Odes*, I, 12, 47, and Pliny, *NH* 2, 93-4, heralding a new age). *Georgics* I, 24-42, clear reference to possible identification with various gods, adding of a *novum sidus*, and to actual cult; *Aeneid* I, 286-94, stars, cult, new age (peace and law).

required but are lacking.<sup>17</sup> Formerly in possession of Mr. Charles L. Morley (who has kindly permitted its publication here), and now in a private collection in Italy, this aureus (PLATE I, 1) is said to have been found in Macedonia. It suggests that the issue with the head of Augustus held equal status with the herald issue of the gold and silver of 17 B.C. and shared its subordination to the cometed head type (see n. 14). These issues clearly celebrate the secular year and cannot, therefore, be juggled around the years as they were at one time.<sup>18</sup> The new aureus has an importance beyond making an addition to its own numismatic group. For in its time it enjoyed special political status as a propaganda piece, and it is important now as a new document for the most famous of the imperial *Ludi Saeculares*, the Augustan Secular Games known to us otherwise from the festal hymn written by the poet Horace, from the *acta* inscribed in stone which mention that hymn, (PLATE A, b)<sup>19</sup> and from coins which commemorate the inscribed *acta* themselves (*BMCEmp.* I, p. 17, 89 and pl. 3, 12; cf. a similar cippus on coins of Domitian, PLATE I, 8). These qualities, together with the apparent uniqueness of the coin today and its excellent condition, lend particular distinction to the new aureus of M. Sanquinius.

<sup>17</sup> Stated e. g., in his "Die Triumviri Monetales unter Augustus," *Num. Zeit.* 71 (1946), p. 119.

<sup>18</sup> It is fortunate that Bahrfeldt (*Die Römische Goldmünzenprägung*, 141, 148), recognized 17 B.C. as the proper date for these coins (Panvini Rosati fails to note this in saying that Willers and Bahrfeldt placed Sanquinius' collegium in 15 B.C., cf. n. 6), though a casual glance at Bahrfeldt's catalogue will not reveal this. Panvini Rosati's "Le emissioni in oro e argento dei 'Tresviri monetales' di Augusto," *Arch. Class.* 3 (Rome, 1951), contains a bibliography of works on the Augustan *monetales*. One of the most recent articles on the moneyers is Konrad Kraft's "Zur Datierung der römischen Münzmeisterprägung unter Augustus," *Mainzer Zeitschr.* 46/47, 1951/52 (abstract in *NL* Oct. 1953, pp. 309-10).

<sup>19</sup> The inscriptions can be seen in Michelangelo's cloister at the Museo Nazionale delle Terme in Rome. The line of interest here reads: **CARMEN COMPOSUIT Q HORATIVS FLACCVS**. The published texts of the Augustan *Ludi Saeculares* are to be found in the *Corpus Inscriptionum Latinarum*, vol. 6, no. 32323; cf. *Suppl.* (ed. M. Bang, 1933); H. Dessau, *Inscriptiones Latinae Selectae*, no. 5050, and in *Ephemeris Epigraphica*, vol. 8, pp. 225-274, with a numismatic commentary by Dressel, pp. 310-15 and one plate of coins; G.B. Pighi, *De Ludis Saecularibus*, Milano, 1941.

The literature on the *Ludi Saeculares* is, like that on Vergil's *Eclogue* IV, of course endless. But brief passages in Hardy, *The Monumentum Ancyranum*, p. 104; Jones, *The Cambridge Ancient History* 10, pp. 150f.; L. R. Taylor's *The Divinity of the Roman Emperor*, pp. 114f., 177-80, may be cited for having caught the spirit of the year 17 B.C. and the "Secular" atmosphere.

## THE DATED COINS OF POMPEIOPOLIS

The most complete and ordered documentation for the history of Pompeiopolis in Cilicia under the Roman Empire comes from a scarce but varied series of coins issued in the city's name.<sup>1</sup> Pompeiopolis in Cilicia, called Soli-Pompeiopolis in many handbooks and catalogues, had its birth in the lap of the ancient Soli, as it were, as a result of the extensive and successful campaign of Pompey the Great against the Mediterranean pirates in 67 B.C. Soli had been devastated and depopulated by Tigranes of Armenia in the decade preceding the establishment of the new foundation. The new city was created by Pompey at the height of his career for the purpose of rehabilitating some of the pirates—this was part of a general plan in accordance with which several such foundations appeared elsewhere in Cilicia and as far west as Patras and Dium in the Peloponnese and even, it is sometimes thought, as far west as Calabria.<sup>2</sup>

The earliest coins of Pompeiopolis, struck almost certainly before the fall of Pompey in 48 B.C., seem to bear no dates; while under the Roman emperors the coins generally, though not always, indicated the year in which they were struck, i. e., the year from the city's foundation. A single coin with a year-date could establish dated coins for Pompeiopolis in the last days of the Roman Republic, and certain evidence for such coinage, though unknown to me, may exist. But evidence for dated coins among the early issues of Pompeiopolis cannot be found, as we shall see, on the issue which was once said to bear a date close to the Battle of Pharsalus and of which the best specimen known to me is in the British Museum (*BMCLycaonia, Isauria, and Cilicia*, p. 152, 48; PLATE II, 10). One of the Greek letters forming the year date on this coin has been misread, and the

<sup>1</sup> For a brief statement on the coinage and the city's history see A. A. Boyce, "The Harbor of Pompeiopolis," *AJA* 62 (1958), p. 67.

<sup>2</sup> Strabo, 8, 7, 5 (388); 14, 3, 3 (665); 14, 5, 8 (671); Plutarch, *Pompey*, 28; Dio, 36, 37; Pomponius Mela, 1, 13, 71; cf. Appian, *Mithr.* 96 and 115; Livy, *Per.* 99; Vell. Pat. 2, 32, 4; Florus, 1, 41, 14; Serv. on Verg. *Georg.* IV, 127; Probus on Verg. *Georg.* IV, 127.

coins of this issue fall not close to the Battle of Pharsalus but rather in the reign of Tiberius. The date (96 = 96, not 16 = 16) makes this clear,<sup>3</sup> though the obverse bears the head of Pompey, the city's founder. It is a tribute to their independence and to the loyalty of the Pompeiopolitans toward their patron, and also to the generosity of the Emperor, that the city's coins were still being struck under the early principate with their customary portrait of Pompey on the obverse. It is also consistent with Pompey's influence in the development of the principate and the importance of his work of organization in the East. So far as I know, an Emperor's portrait first appeared on the coins of Pompeiopolis under Nero.<sup>4</sup>

The misinterpreted issue from the reign of Tiberius is of relatively superior quality when seen together with the rest of the city's coinage. It is a fitting document with which to begin an examination of the dated coins of Pompeiopolis. Though not of the early date once attributed to it, it is yet the earliest issue of Pompeiopolis known to me which indisputably bears a date. It still heads any list of the dated coins of that city.<sup>5</sup>

In 1883 Imhoof-Blumer published his list of the dated coins of Pompeiopolis as part of a study dealing with some coins of the Cilician cities in the *Zeitschrift für Numismatik* 10, p. 296. In 1931 there appeared another list of the city's dated coins, this compiled by C. Bosch as part of a long list of the dated coins of the cities of Asia Minor under the Roman Empire.<sup>6</sup> From evidence accumulated or reconsidered since Imhoof's time and later than his subsequent references to the coins of Cilicia,<sup>7</sup> and from a wider background of numismatic material from Pompeiopolis than was in Bosch's hands,

<sup>3</sup> See the detailed discussion, pp. 14-15.

<sup>4</sup> The obverse with the Emperor's portrait is amply attested by specimens in the Paris, Ashmolean, Gotha, Berlin and Vienna collections.

<sup>5</sup> On republican or possibly early imperial coins which may seem to bear year-dates, the letters seeming to be dates are, because of their place in the coin design, more probably abbreviations of magistrates' names. Those coins which show the head of Pompey and lack a year-date, and are not in sufficient supply to produce arrangement through die-study, will have to be arranged by the criteria of design and style, type- and magistrate- identities.

<sup>6</sup> C. Bosch, "Kaiserdaten auf kleinasiatischen Münzen," *Numismatik, Internationale Monatsschrift* II (München, 1933), p. 62.

<sup>7</sup> "Coin Types of Some Kilikian Cities," *JHS* 18 (1898), pp. 165-9; cf. brief references in his *Monnaies Grecques* (1883), p. 365.

a more reliable list can be prepared. The revised list presented in this discussion may not necessarily be complete since the evidence is derived only from certain major national or other institutional collections and a few private collections.

Imhoof's list contained a dozen items from the "16th" year of the city to the "309th." The last he listed with a question-mark. As far as can be determined, neither of these dates has ever appeared on the coinage. Imhoof-Blumer's complete list and my commentary on it follow. I have omitted Imhoof's B.C. and A.D. equivalents of the dates indicated by Greek letters while retaining the names of emperors.

1. ΙϚ	(16)	
2. ΜΕ	(45)	Augustus
3. ΘΜΡ	(149)	Domitian
4. ΘϚ	(209)	Antoninus Pius
5. ΘΚϚ	(229)	L. Verus
6. ΒΝϚ?	(252)	Commodus
7. ΓΞϚ	(263)	Caracalla
8. ΓΟϚ	(273)	Caracalla
9. ΒΠϚ	(282)	Caracalla
10. ΓΠϚ	(283)	Macrinus
11. ΣΤ	(306)	Gordian III
12. ΘΤ?	(309)	Gordian III

No. 1 does not exist. The evidence given for this date is a coin in the British Museum (*BMCCilicia*, p. 152, 48; PLATE II, 10). The obverse of this coin has a head of Pompey, its reverse a standing Athena holding a Victory. Abbreviations of magistrates' names appear in left and right fields. Following the ethnic, ΠΟΝΤΗΙΟΠΟΛΙΤΩΝ, ΕΤΟΥϚ ΙϚ is read, ΙϚ = 16. The first letter of the date is not *iota*, however, but ϣ, making the date ϣϚ = 96. The date can also be read on an example in Copenhagen with the same dies as the BM piece. On similar specimens with the same obverse die but different magistrates' names on the reverse—in the British Museum, Paris, and Berlin—the date is in a different position and has been rather artificially rendered. In addition to this there are in a private collection (Dorsey Stephens) and at Berlin two smaller Æ coins with a different reverse type (seated Athena) and of cruder workmanship but showing the same

date, the year 96. One at least, the Stephens coin, is in fine condition, affording a perfect reading of the date 96, following the ethnic. The written description I have from Berlin of the piece in the *Münzkabinett* there indicates that the year is 96. Whatever the foundation year of Pompeiopolis, this date would have to fall in the reign of Tiberius, probably A.D. 30/31 or 31/32.

Like no. 1, item no. 2 in Imhoof's list does not exist. Its appearance in the list results from reading as a date that which is evidently the abbreviation of a magistrate's name (ME) on the reverse of a coin struck under Domitian but bearing the portrait of Pompey on the obverse (PLATE II, 16-17). Imhoof cited a specimen in Paris and one in his own collection. These coins are clearly part of the coinage struck under Domitian in two parallel series bearing the portrait of the Emperor in one series and the portrait of Pompey in the other. They have nothing whatsoever to do with Augustus or the Augustan age, as ME, if it were a year-date, would require. In his article on the coin-types of some Cilician cities in *The Journal of Hellenic Studies*, 1898, Imhoof did not include these coins in his discussion of Pompeiopolis.

Between nos. 3 and 4 should be placed a date under Hadrian, 59P (196). The only example of this coin known to me at present is in the Newell Collection at the American Numismatic Society (PLATE III, 20). Its reverse type is, like that of its predecessors, standing Athena holding a Victory.

Item no. 6 in Imhoof's list—"BNC?" for Commodus—I do not now know from any authoritative source. The date appears to have come from Vaillant through Eckhel. The examples of the coins of Commodus known to me—all bearing the water-deity, Pêgê Sounias, on the reverse—in the British Museum, Paris (2), Berlin, and the Newell Collections—are undated. Pêgê Sounias appears also on a Paris piece of Caracalla which bears the date 70C (273); but the coins of Commodus with this type seem to be undated.

For no. 9, which is listed correctly, Imhoof notes that ΕΠC has been erroneously read for ΒΠC,<sup>8</sup> an error which Bosch did not avoid. It seems obvious that this resulted from a coin on which the B was in a poor state of preservation (see below p. 19).

<sup>8</sup> *ZfN* 10 (1883), p. 289; on Haverkamp, *Num. reg. Christ.*, p. 202, pl. 28, 18.

Between nos. 10 and 11 there belongs a year H $\eta$ C (298) which appears on the coins of Julia Mamaea (PLATE IV, 27). Imhoof recorded this in *Rev. Suisse de Num.* 1908, p. 108.

For coins of Gordian III the dates ST (306), PLATE IV, 28, and HT (308), PLATE IV, 29, are known to me, but not  $\Theta$ T (309).<sup>9</sup> Theta could easily be mistaken for Eta due to the poor condition of the coin at that point.

Later than any date on Imhoof's list of 1883 is IAT (311), well-attested for Philip I and Philip II (PLATE IV, 30, 31). This date appeared, however, in Imhoof's article on the Cilician cities in *JHS*, 1898, p. 169. The coins of Trebonianus Gallus, with those of his son, Volusian, which apparently ended the issues of Pompeiopolis, are undated.

Clemens Bosch, in his list published in 1931, begins with a date taken from coins bearing the portrait of Nero—the year listed is 131. For this date Bosch cites coins in Paris, Berlin, and Vienna.

There are two general groups (distinguished by the abbreviated names of magistrates) of Pompeiopolitan coins bearing the portrait of Nero on the obverse (PLATE II, 11, 12). The Berlin piece belongs to the group represented here by PLATE II, 12, but this coin is in poor condition and there is nothing to indicate that a year-date can be read on it. The one Viennese piece known to me, issued under a group of magistrates different from those responsible for the Berlin piece and comparable to the Paris piece (PLATE II, 11), shows no legible letters which concern a year-date. All of the legible letters on it must refer to the ethnic or to magistrates' names. There are four Paris coins of the Neronian issue; two in each of the two groups known to me. All of these coins hold out definite possibility of year-dates, 130 for one group, 131 for the other. But the epigraphical difficulties are considerable and I prefer to suspend judgement until I have more reliable evidence.<sup>10</sup> The Neronian coins are too important to dismiss without thorough study.

<sup>9</sup> Eckhel, *Doctrina Numorum Veterum* 3, p. 69 and Mionnet, *Suppl.* 7, p. 251, no. 377, record this from Vaillant.

<sup>10</sup> On the first Paris piece illustrated here (PLATE II, 11) and representing one Neronian group, there are strokes which may signify the N at the end of the ethnic, though legible ethnics on Ashmolean and Viennese specimens indicate that the ethnic stopped short of this point. Following these strokes there

While Bosch gives but one year-date for Nero, he offers two for Domitian, 149 and 152. The evidence for the year 149 is certain, for ΘMP can be clearly read on a number of specimens. The evidence for 152 is not quite as clear. An analysis of the Pompeiopolitan coins struck in the reign of Domitian is in order. From the evidence now at hand it appears that there are three main groups (PLATE II, 13-19). The first was supervised by four magistrates: AAK, MA, MH, and NE (PLATE II, 13-15). These men issued coins with obverse portraits of Domitian and Pompey, each portrait represented by a single die. The obverses of Domitian and Pompey shared a single reverse die at first with MH and NE, AAK and MA in the r. and l. fields respectively. I have seen only one specimen of Pompey (a Paris piece) with this reverse die (PLATE II, 14). A second reverse die with a new distribution of the magistrates' names was made to go with the obverse of Pompey, MH, NE and MA being in the r. field and AAK in the l. field on the new die (PLATE II, 15). At present I know of this second reverse die only for Pompey. For this reason and because under Nero the imperial portrait had taken the place of Pompey's portrait—a practice which coinage struck under Domitian might be expected to follow—I am led tentatively to suppose that the coins with Domitian's portrait came first, followed by the coins with Pompey's portrait. Before this latter issue ceased a new reverse die had to be made to go with Pompey's obverse. All of these coins belong to the year of the city 149—the evidence for the date, the letters ΘMP after the ethnic, is clear.

appear I P (incomplete monogram for Pompeiopolis?) and ΕΤΠ (CTPA would be alternative though not so suitable): "of the Pompeiopolitan year 130" (?). The second piece illustrated (PLATE II, 12), also a coin in the Cabinet des Médailles and representing a second Neronian group of Pompeiopolis, is the best specimen of four examples of which I have casts and photographs. All have the same reverse die and the piece in the Gotha Collection shows that the ethnic did not pass beyond the bottom of the right rim of the coin—this means that the few strokes visible along the left rim may represent a year-date. Are they ΛΛP=ΑΛP= 131? These strokes can be seen on a second Paris specimen. The problem of their significance is complicated by the fact that before ΠP and ΔH (presumably abbreviations for magistrates' names) appear the letters Λ ΛP (so spaced). Do these letters represent magistrates (or a magistrate), as their position before ΠP and ΔH suggests, or do *these* indicate a year date, Α ΛP (131)?



The second group is less simple to define. Again we have the portraits of the Emperor and Pompey (PLATE II, 16–18). The same obverse die as for the first group was used for Pompey (PLATE II, 16, 17), but a new portrait die was made for Domitian with a new arrangement of his name (PLATE II, 18), suggesting that by now the obverse of Domitian made for MH, NE, AAK and MA was well worn and had to be replaced. New magistrates appear on these coins—a basic criterion, along with the new die and the name-position of Domitian, for postulating the second group. The magistrates are ΔIO, AC?, CA, and ME. The first three are in the left field, the fourth along the left rim of the coin (PLATE II, 16–18). A third group closely related to group two is represented by a single specimen in the British Museum (*BMCCilicia*, 57; PLATE II, 19) with a similar obverse die of Domitian but the following magistrates on the reverse: ΔH, ΛA, and CA in the left field, and ME along the left rim.<sup>11</sup> In other words, the first two names have changed from ΔIO and AC? to ΔH and ΛA. So far I have no examples of these last magistrates coupled with an obverse showing a portrait of Pompey. Such obverses may not, of course, have been made.

While the date on group one discussed above is clear (ΘMP), the date on groups two and three is not. For group three (PLATE II, 19) Bosch followed the reading of *BMC*, 57: BNP, that is, 152: but the condition of the letters following the ethnic is such that I prefer to postpone the acceptance of this reading until further investigation. A Paris piece (Domitian) appears to confirm the N (50), but N is sometimes easily confused with M on these coins. The P is clear. N and B might easily be something else; and a Berlin specimen, of which I do not have a cast or photograph, has been described to me as reading PME, i. e., EMP, which suggests that the date to be read on these coins is, as in group one, ΘMP (149), epsilon having been read for a worn theta in the case of the Berlin piece, and BN for ΘM on *BMC*, 57. If, however, there are two year-dates under Domitian, 149 and 152, two to three years passed between the striking of groups one and three (149 and “152”) and we have to be willing to admit—because of the close relation between group two and group three—the use of the same obverse die of Pompey in the years 149 and 152.

<sup>11</sup> *BMCCilicia*, p. 154, no. 57 reads ΔH, ΛA, KA, and, after the ethnic, BNP MH.

Up to this point it seems to me wise to assert the striking of Pompeiopolitan coins under Domitian in the year of the city 149, but to question the issue of Pompeiopolitan bronze under Domitian in year 152, or at least suspend judgment.

In Bosch's list, as in Imhoof's, no year is listed under Hadrian. This is not surprising, since the only coin I know at present which was struck for Pompeiopolis under Hadrian is in the Newell Collection at the American Numismatic Society and bears the date  $\Sigma\text{P}$  (196) in the lower l. field, PLATE III, 20. Bosch's list properly lacks Imhoof's tentative item (6), a year-date 252? for Commodus. I find no evidence for any year-date on the Pompeiopolitan coins of Commodus known to me (see p. 15). On the other hand, Bosch omitted Caracalla's year-date 282 (which is in Eckhel, *Doctr. Num. Vet.* III, p. 69) and wrongly included a year-date "285" (Elagabalus), as did Eckhel (p. 69). The erroneous date "285" seems to me clearly derived from the misreading of BPC (282) on coins of Caracalla. This is clear from the following facts. The piece cited by Bosch for the evidence is a Paris coin. There is no Paris coin of Elagabalus, and Eckhel's source (S. Haverkamp, *Nummophylacium Reginae Christinae*, The Hague, 1742), though reproducing the date incorrectly on Tab. 28, gave the correct reading on p. 203 and properly attributed the coin to Caracalla, not Elagabalus. Eckhel knew that a date "285" would have to refer to the reign of Elagabalus and so changed the attribution to that Emperor.<sup>12</sup> Actually, the date is 282, the emperor, Caracalla. The B has been read incorrectly as €. It is not surprising, in view of this error, that Bosch's list lacks the year-date 282, which appears on the coins of Caracalla. The rest of Bosch's list is in general agreement with the revised list here presented.

<i>Year of Pompeiopolis on Coins</i>	<i>Imperial Reign</i>	<i>Example of Coin Illustrating Year</i>
$\text{P}\zeta$	Tiberius	PLATE II, 9, 10; D. Stephens, BM
$\text{PA? AAP?}$	Nero	11, 12; Paris
$\text{OMP}$	Domitian	13, 14; Paris 15; BM

<sup>12</sup> *DNV* 3, p. 69; Imhoof was aware of this error; see p. 15 above and n. 8.

<i>Year of Pompeiopolis on Coins</i>	<i>Imperial Reign</i>	<i>Example of Coin Illustrating Year</i>
ΣΡΡ	Hadrian	PLATE III, 20; Newell
Θϸ	Antoninus Pius	21; Paris
ΘΚϸ	M. Aurelius	22; Paris
	L. Verus	
Γϸϸ	Sept. Sev. (coins of Julia Domna and Caracalla)	23; Newell
ΓΟϸ	Sept. Sev. (coins of Sept. Sev., Caracalla, probably Julia Domna and Geta)	24; Newell
ΒΠϸ	Caracalla	25; Paris
ΓΠϸ	Macrinus, Diadumenian	PLATE IV, 26; Vienna
ΗΡϸ	Sev. Alexander (coins of Julia Mamaea)	27; Paris
ΣΤ	Gordian III	28; Vienna
ΗΤ	Gordian III	29; Vienna
ΙΑΤ	Philip I	30; Munich
	Philip I (coin of Philip Caesar)	31; von Aulock

There are coins of Trebonianus Gallus and Volusian, but they seem not to be dated. It is to be noted that the earliest date in the list is written from left to right, but from Domitian, if not before, the dates read from right to left. Omitted here but perhaps belonging with the single year listed for Domitian may be PLATE II, 16–19, from Paris (16, 18), the Ashmolean Museum (17), and the British Museum (19).

The most striking result of this revised but still tentative listing is the removal, at least for the present, of the dated coinage of Pompeiopolis from the period of the Roman Republic. The dated coinage, beginning with the year 96, not 16, appears to have been initiated under Tiberius and evidently did not, as Imhoof thought, commence while Pompey was still alive. It is somewhat disappointing, I confess,

not to have the first dated coinage fall close to the Battle of Pharsalus! But we now gain a truer picture of the coinage in respect to the indications of chronology on it, i. e., specific year-dates, and we are placed in a position to understand better the sequence of issues, their style, and the tradition of Pompey under the early Empire. The corrected date enables us to discover the sequence of some of the earlier *undated* coins.

Briefly, recognition of 96 as the correct reading of no. 1 in the list of dates helps us to discover significant points in the order of the coins, dated and undated. Two sizes of coins show the date 96—the large Æ of superior style cited by Imhoof-Blumer (head of Pompey, star in front/standing Athena holding Victory; PLATE II, 10) and a smaller Æ known to me from the Berlin and Dorsey Stephens Collections (head of Pompey/seated Athena holding Victory; PLATE II, 9). Besides the common year-date, 96, this difference between the two sizes of Æ is noticeable: that the reverse type of the larger piece is a standing Athena, of the smaller, a seated Athena. Both were struck under Tiberius and perhaps represent the last coinage issued for Pompeiopolis before an imperial head began to appear on the obverse instead of, or in addition to, the head of the city's founder, Pompey the Great. The Pompeiopolitan coinage bearing the Emperor's head on the obverse has as a reverse type under Nero and Domitian a standing Athena holding a Victory. This type appears also under Hadrian and under Antoninus Pius (on whose coinage new reverses are introduced), and it appears occasionally in the third century right up to the end of the coinage, though lacking the Victory from the time of Gordian III. This convention of a standing, never a seated, Athena under the Empire suggests that the seated type of the year 96 (PLATE II, 9) preceded the standing type of the same year (PLATE II, 10). This is suggested further from still earlier and undated coins where there is a transition from a standing Victory type (not illustrated here) to the seated Athena type—a transition in this case made clear from the striking of both types by the same magistrates. The above brief analysis is sufficient to indicate the importance of the evidence of as many coins as possible for the establishment of a valid chronological sequence of both dated and undated coins. Analysis and discussion of the whole series must be deferred until the garnering of evidence has been completed.

## THE NINTH CONSULSHIP OF DIOCLETIAN AND THE CONSULAR REVERSE

In epigraphical and numismatic handbooks, offices and titles of the Roman emperors are usually listed without indication of the evidence on which such listings are based. Sometimes the evidence will be given for some of these offices and titles while omitted in the case of others. As an example of an office for which the evidence is never listed, the ninth consulship of Diocletian is a case in point.<sup>1</sup> The evidence for this consulship is both meager and little known. In the consular lists published by Mommsen in the *Monumenta Germaniae Historica*, the ninth consulship of Diocletian can be found listed along with the eighth of Maximian under the year A.D. 304,<sup>2</sup> and it appears several times in the *Codex Justinianus*.<sup>3</sup> But evidence contemporaneous with the reign of Diocletian is exceedingly slight. So far as I know, an inscription mentioning this consulship has been found but once, in "rozzi caratteri" on the back of a stone on the front of which are inscribed the proceedings of the college of Arval Brethren from about the middle of the second century A.D. The Diocletianic inscription was published by R. Paribeni (*Notizie degli Scavi di Antichità*, 1919, pp. 105-106) at the end of his edition of the Arval record (PLATE A, c).<sup>4</sup> The stone, once in private hands, is now in the Museo Nazionale delle Terme with the other *acta* of the Fratres

<sup>1</sup> E.g., in R. Cagnat, *Cours d'Épigraphie Latine* (4th ed., Paris, 1914), p. 233; Sir John Sandys, *Latin Epigraphy* (2nd ed., revised by S. G. Campbell, Cambridge, 1927), p. 253; M. Bernhart, *Handbuch zur Münzkunde der römischen Kaiserzeit* (Halle, 1926), p. 307; A. Degraffi, *I Fasti Consolari dell'Impero Romano* (Rome, 1952), p. 77. On the other hand, such a work as E. Ruggiero, *Dizionario Epigrafico*, 2, (Spoleto, 1912), p. 1886 (G. Costa), refers to numismatic evidence for COS III to COS VIII; cf. p. 1169.

<sup>2</sup> *Chron. Min.* I, pp. 60, 66, 231; III, pp. 379, 396; presumably the listings in I, pp. 291, 447, and 710 are wrong as is II, p. 150: "Diocletianus VIII et Maximianus VIII."

<sup>3</sup> *Codex Justinianus*, 3, 28, 26; 9, 1, 18; cf. Mommsen, *Gesammelte Schriften* 2, p. 90, n. on 210 (11), 1.

<sup>4</sup> See also E. Pasoli, *Acta Fratrum Arvalium Quae Post Annum MDCCCLXXIV Reperta Sunt* (Bologna, 1950), p. 49, frag. 102.

Arvaes. Apart from this crudely inscribed and scanty record, only rare aurei from the mint of Siscia and one papyrus,<sup>5</sup> provide direct source material for the ninth consulship of Diocletian. Mention of a tenth consulship naturally suggests that the ninth had been observed, and any document mentioning a tenth,<sup>6</sup> can of course be regarded as evidence for a ninth. But it remains true that precise information on the ninth consulship contemporaneous with Diocletian's reign has come down to us from but a fragmentary inscription, a few gold coins (only two are known to me), and a piece of papyrus.

Our concern here is primarily with the numismatic evidence. Two aurei mentioning the ninth consulship of Diocletian were listed by Karl Pink in his article on Diocletian's gold coinage (*Numismatische Zeitschrift*, 1931), one in the Trau Collection, one in Vienna.<sup>7</sup> That there are in existence other specimens is very likely.

After the publication of Pink's catalogue of the gold coinage of Diocletian and his colleagues, the Trau aureus passed through several sales<sup>8</sup> and eventually found its way into the Brummer Collection, whence, in 1949, it was acquired by the ANS. As one of the few documents recording Diocletian's last official consulship, and as a coin whose reverse type, as well as its reverse legend, is consular;

<sup>5</sup> B. P. Grenfell and A. S. Hunt, *The Oxyrhynchus Papyri* 12 (London, 1916), 1551.

<sup>6</sup> See Grenfell and Hunt, *New Classical Fragments* (Oxford, 1897), 72 (as corrected by Mommsen, "Consularia," *Hermes* 32, p. 544) and 75, lines 18-19 and p. 118: "as a matter of fact the last year in which these emperors were consuls was 304, for the ninth and eighth times respectively, and they abdicated in May 305, for which year the consuls were Constantius and Galerius. The explanation is that the news of the change had not yet reached the Oasis, and so the consuls of 304 were supposed to be still in office." See also *The Oxyrhynchus Papyri* 14 (1920), 1645 and 18 (1941), 2187 including p. 141, n. 1, documents which will have to be discounted as incorrect or uncertain evidence.

<sup>7</sup> K. Pink, "Die Goldprägung des Diocletianus und seiner Mitregenten," *Num. Zeit.* 64 (N. F. 24), 1931, p. 56. It appears that in the list of abbreviations for collections (p. 4, n. 3) no provision was made for the Vienna Cabinet, while W was said to indicate the Weifert Collection. In the catalogue which follows W must stand for "Vienna," and Wf, not indicated in the list of abbreviations, for Weifert. The companion piece to the ANS aureus (ex Trau) is indicated in the catalogue as W; cf. "Tafelverzeichnis," p. 59, no. 68 ("Wien") and pl. III, 68.

<sup>8</sup> Hess Sale Cats., May 22, 1935, no. 3335 and April 28, 1936, 2703; Münzhandlung Basel Cat. no. 10, March 15, 1938, 751.

this aureus deserves to be studied for its mint and type, as well as for its date, i. e., in its numismatic and historical background. A description follows:

*Obv.*: DIOCLETI ANVSAVG

Head of Diocletian r., laureate.

Border of dots.

*Rev.*: CONSVLVIII PPRCOS

Emperor st. three-quarters l., head l., laureate, wearing embroidered toga and holding globe in r. hand, short sceptre in l.

Below ground line, SIS

Border of dots.

↑ 19.5 mm.

4.9 gm.

PLATE V, 32

There seems to be no doubt that the ninth consulship began in A.D. 304 (see n. 2). The eighth had occurred in 303, and the abdication took place in 305. No major chronological problem therefore arises from our sources. The provenance of the sources is worth noting. The inscription is Roman, the papyrus was written in Egypt, the coins were struck at Siscia in the Balkans. The scanty evidence, then, comes from widely scattered parts of the Empire.

All of Diocletian's consulships from III through VIII are recorded on the gold coinage.<sup>9</sup> There are several types bearing consular dates, but it appears that only our standing togate type was used for every consulship from III to VIII, a fact which suggests the primarily consular character of the type. In order to give a complete picture from the evidence known to me, with all mints known to have struck the type represented, and all variants of the type listed, I have constructed a table listing the occurrence of the type at various mints for the various consulships. The material on which this table is based is from Pink's study of the gold coinage<sup>10</sup> and from such evidence as is provided by the coins and photofile at the ANS.<sup>11</sup>

<sup>9</sup> The only consular date on the antoniniani is COS IIII, on coins attributed to Lugdunum (*RIC* 4, 5). It therefore appears that there is a special reason for recording the consular dates on gold; see the discussion on pp. 29 ff.

<sup>10</sup> Op. cit., pp. 42; 48–51; 56.

<sup>11</sup> See also A. Missonig's lists, "Die Vorläufer der Werthzahl OB auf römischen Goldmünzen," *ZfN* 7 (1880), pp. 268–71.

TABLE OF CONSULAR TYPES

Diocletian				Maximian			
Mint Mark	Consul- ship	Sceptre?	Yr. of Entrance Upon Consulship		Sceptre?	Consul- ship	Mint Mark
	III	Sceptre	287				
	IIII	Sceptre	290	290	Sceptre	III	
	IIII	No sceptre	290	290	No sceptre	III	
SMAΞ	IIII	No sceptre	290	290	No sceptre	III	SMAΞ
SMAΞ	V	No sceptre	293	293	No sceptre	IIII	SMAΞ
SMAΞ*	V	No sceptre	293	293	Sceptre	IIII	SMAΞ*
SMAΞ*	VI	Sceptre	296				
			297		Sceptre	V	SMAΞ*
			297		?	V	SMAΞ*
			297		Sceptre	V	SIS
SMAΞ*	VII	?	299	299	Sceptre	VI	SMAΞ*
SMAΞ*	VII	Sceptre	299	299	Sceptre	VI	SMAΞ*
*SMAΞ*	VII	?	299	299	?	VI	*SMAΞ*
			303		Sceptre	VII	SMAΞ*
			303		Sceptre	VII	SMAΞ*
			303		?	VII	SMAΞ*
SIS	VIII	Sceptre	303	303	Sceptre	VII	SIS
SIS	VIIII	Sceptre	304	304	Sceptre	VIII	SIS
			304		Sceptre	VIII	SMAΞ*

(Where the question-mark appears the emperor probably carries a sceptre.)

## CONSULSHIPS OF DIOCLETIAN AND MAXIMIAN

Diocletian		Maximian	
COS	284		
COS II	285		
	286		
COS III	287	COS	
	288	COS II	
	289		



Diocletian		Maximian
COS IIII	290	COS III
	291	
	292	
COS V	293	COS IIII
	294	
	295	
COS VI	296	
	297	COS V
	298	
COS VII	299	COS VI
	300	
	301	
	302	
COS VIII	303	COS VII
COS IIII	304	COS VIII
	305	

## NOTE ON MINTS AND SOME DETAILS OF STYLE

It is pertinent to the subject to make some observations on the mints which struck the consular aurei. Besides pieces with the mint mark of Antioch (far surpassing in number the later consular aurei with the mint mark of Siscia) are aurei with no mint mark at all. They bear COS IIII types for Diocletian, COS III types for Maximian and have been assigned to both Cyzicus and Antioch. On these aurei the standing Emperor-Consul sometimes holds a sceptre, sometimes not (PLATE V, 34-38). An elongated globe in the emperor's right hand (PLATE V, 38), moreover, appears along with regular spherical globes. Such an elongated globe seems not to appear on mint marked aurei of Antioch. This elongated globe may therefore be considered a mark of Cyzicus. The attribution of these aurei to Cyzicus gains strength when one compares the portraits on the obverses with the portraits on the few available early specimens of Cyzicene "Reform" Æ coins of the Tetrarchy, which are mint marked. A check through the many Newell trays of Tetrarchy Æ reveals in the case of no other mint such identity of style with these aurei, the only other possible similarity

of portrait style between them and the early "Reform" Æ being found at the mint T(icinum), where the neck-line is different. It may be added that antoniniani attributed to the same mint (PLATE V, 39, 40) have portraits closely similar to the portraits on the Cyzicene Æ and on the aurei of Diocletian (COS IIII) and Maximian (COS III) attributed to Cyzicus.

The point at which these issues acquired the mint mark of Antioch seems to have occurred when the last aurei of Diocletian with COS IIII PPPROCOS were struck. For though I have found no die identities in the material I have examined, (on the contrary the issues with the mint mark of Antioch show a deliberate change in the length of the diadem ends, for they are shortened), very similar portraits on certain aurei of Diocletian without mint mark but with elongated globe (PLATE V, 38) and on aurei with mint mark of Antioch (PLATE V, 41, 42) show that at least a die, if not an engraver of dies, for aurei moved from Cyzicus to Antioch. The gold coinage without mint marks ceases within Diocletian's COS IIII, while the gold coinage of Antioch with mint marks begins in the same consulship and continues into V, VI and VII. These facts seem to indicate that the whole aureus-producing section of the Cyzicene mint, not just one engraver, made the move: eastern gold was now to be struck at Antioch. The change, which must have taken place in 292 (COS IIII), was doubtless part of the reorganization connected with the establishment of the Tetrarchy in March, 293. The subsequent development into full Reform style aurei at Antioch can be seen on PLATE VI.

On the reverses of the first Antiochene consular aurei the Emperor bears no sceptre. On the earlier aurei without mint mark there were "sceptre" types and "no sceptre" types, the latter being later as the accompanying simpler neck-line of the head on the obverse and the larger head approaching full Reform portraiture reveal. This explains the fact that the Antiochene issues of Diocletian before CONSVL VI and of Maximian for the earlier aurei with CONSVL IIII are without sceptre. The appearance of the sceptre in the hand of the Emperor at Antioch evidently took place in the fourth consulship of Maximian and the sixth consulship of Diocletian, therefore in 296 (see table of consulships above), as PLATE VI shows, unless indeed an aureus can be produced which will show Diocletian carrying the sceptre at Anti-

och in his fifth consulship. The Antiochene consular issues finish then with the Emperor conspicuously bearing a sceptre. In this respect they resemble the ANS Siscian aureus which bears the latest consular date of all (VIII). Finally, it may be worth repeating that a feature characteristic of many of the Cyzicene issues never occurs on the consular aurei of Antioch—the elongated or oblong globe in the hand of the Emperor. By contrast the globes on the Antiochene pieces always appear as true spheres. Particularly noteworthy in respect to this detail is the perfectly spherical globe in the hand of the consular Diocletian of Siscia (PLATE V, 32: also of later date than the Cyzicene pieces), for on it we see clearly two crossing bands, twice dividing the sphere into hemispheres. A close look at an ANS Siscian coin struck for Maximian's fifth consulship (PLATE V, 33) reveals the same attention to this detail. I find it on none of the other consular pieces illustrated here.<sup>12</sup>

A study of the chronology of the mints as given by Pink in the article cited, and our knowledge of the transfer of the Cyzicene mint to Antioch in Diocletian's COS IIII (A.D. 290–292), suggest that our consular type could have been struck only at three mints, Antioch, Siscia, and Augusta Treverorum, for all other mints had ceased to strike gold by A.D. 303, the date of Diocletian's eighth consulship. Augusta Treverorum may not have been striking gold then, but we have reason to assume that Antioch, which issued relatively many consular aurei, may have struck COS VIII gold for Diocletian, as well as Siscia, a mint from which relatively few consular aurei seem to have been issued. For, since Siscia struck COS VIII pieces of Maximian, there may yet turn up now theoretical Antiochene COS VIII pieces of Diocletian.<sup>13</sup>

The existence of consular aurei of Diocletian and Maximian with the consular number points up the relative scarcity of consular dates on coinage immediately preceding their reign and on the inscriptions of their own time. In the second half of the third century consular

<sup>12</sup> For attention to this detail under Antoninus Pius, see *BMCEmp.* IV, pl. 16, nos. 2, 5.

<sup>13</sup> Pink has great confidence in the theory that unknown pieces postulated through knowledge of the coinage may yet actually turn up. Since we have a Siscian aureus of Maximian struck for COS V (Newell, PLATE V, 33), an aureus of Siscia struck for Diocletian's COS VI may yet turn up.

years had appeared on the coins of all metals under Valerian and Gallienus, to judge from the material in *RIC* V, 1. Thereafter the practice of recording the consular year on the coins seems to have been used exceptionally, barring the Gallic Empire, where the tradition was carried forward. With Probus there was a strong revival of the usage, but the coinage of Carus seems to have lacked consular dates, and the light of this tradition flickered but faintly under his sons.<sup>14</sup> As for contemporary inscriptions, although epigraphical evidence is relatively slight at this period of the Empire, it seems clear that the consulship and other number offices and titles seldom appeared in the inscriptions of Diocletian. The later consulships particularly (after COS IIII) are lacking, as is revealed by a survey of material (chiefly from *CIL*) in Dessau, *ILS* and Ruggiero, *Dizionario Epigrafico* (pp. 1886–88, where the consulships are listed, though the tribunician years are the chief point of interest) and in the *Année Épigraphique*. The almost complete absence of COS VIIII from inscriptions is probably due to the *mores* of the time as much as to our lack of epigraphical evidence in the fourth century. In any case this state of affairs makes the fourth century coins more precious than they would be if there were more inscriptions or if the custom of the time had been traditional. Diocletian had revived a once-honored and common practice.

Why was the consular number regularly recorded on gold coins and not in inscriptions? (Papyri are another question, being on the whole local documents.) The answer may lie in the constitutional character of the fourth century consulship and the manner in which a new consulship was celebrated.

As the reign of Diocletian advanced, the consulship became more and more prominent on the coins,<sup>15</sup> and the reappearance of its mention on the coins seems to indicate that it was itself being commemo-

<sup>14</sup> Constantine continued the practice of commemorating the consulship with consular number on gold, but later it disappeared again. While there are some dated coins under the late Empire (even under Theodosius II there appeared exceptional legends with number titles IMP XXXXII COS XVII and IMP XXXXIII COS XVIII), the chief indication of date had become the vota periods, of which the precise meaning must be sought in each case.

<sup>15</sup> The first consulship of Diocletian mentioned on coins is III, the first held during Maximian's reign and coinciding with the first consulship of Maximian in A.D. 287 (Pink, p. 2).

morated, and was not being used as a means of dating the document, as previously on coins and inscriptions and in imperial laws recorded later in the Theodosian Code. The types of the reverses support this impression.

An august name, glamor and honor still were identified with an office of which the real constitutional significance had melted into the past.<sup>16</sup> Diocletian must have renewed consular dates on the coinage for very concrete reasons, especially since the renewal was limited chiefly to gold, i. e., to aurei and gold medallions.<sup>17</sup> The consulship itself seems to have been the point of interest, not the consular number simply as part of a conventional recording of offices for dating the issues. The type accompanying the legend seems to bear this out.

The type representing Diocletian togate with globe and short sceptre is probably to be associated with the entrance upon a new consulate and with the attendant *processus consularis*. This is implicit in the combination of the type with a consular date attached to it as a legend, e. g., COS VIII PP PROCOS, in the fact that the type appeared only on gold, a fact which may be due to the bestowal of largesses of gold upon the entrance by the Emperor into a new consulate. But actual proof for the association of the type with a new consulate and the attendant *processus consularis* is still required. It is only suggested, I think, in similar types of earlier date; actual proof can be found in later types.

It is not necessary for a coin type to be derived from earlier coin types rather than from contemporary life. Yet numismatic design, like other art forms, reveals a certain historical development; alternate dependence upon, and departure from, tradition. The remote forerunner of our type, which Diocletian used as early as his third and fourth consulships,<sup>18</sup> seems to be the togate figure of Antoninus Pius standing l., holding globe in extended r. hand, ritual roll in l. (PLATE VII, 51, 52).<sup>19</sup> Is this type consular? It bears the consular

<sup>16</sup> Pauly-Wissowa, *Realencyclopädie*, s. v. *Consul*, col. 1133-34.

<sup>17</sup> For medallions see Pink, p. 24; Gneecchi, *I Medaglioni Romani* I (Milano, 1912), pl. 4.

<sup>18</sup> Pink, pp. 42, 48.

<sup>19</sup> *BMCEmp.* IV, pp. 108, nos. 743-743A; III, no. 771; II, no. 772; I, no. 795; I, no. 796-8; I, no. 812-13; I, no. 814-15; I, no. 835; I, no. 843; I, no. 863-4; cf. seated type, on curule chair, *ibid.*, pp. 313-14, nos. 1887-9.

number, to be sure (COS IIII) but the type continued to appear long after Antoninus Pius entered upon COS IIII and consecutively over a number of years (A.D. 151-156), as is indicated by the annually changing tribunician number recorded along with the consular number. The use of the type under Antoninus Pius therefore seems not to have been related especially to entrance upon the consulship and the attendant festival. Let us look more closely at the details of the type, particularly the globe, which persisted, and the ritual roll, which gave way in the third century to a short sceptre.

Before Antoninus Pius, emperors had been represented on coins receiving the globe from predecessor or delivering it to heir and successor.<sup>20</sup> There were at the same time some variations on this theme, for Hadrian had been represented as receiving the globe as well as the sceptre from Jupiter,<sup>21</sup> and Nerva had received the globe from, or shared it with, the Senate.<sup>22</sup> The ritual roll in the hand of the emperor is an object familiar from sculptural reliefs and coins. But only when we come to the above-mentioned type of Antoninus Pius (globe in extended r., ritual roll in l.) do we find anything similar to the third century type which more and more often substituted the short sceptre for the ritual roll. The point at which this substitution took place should give us our true prototype for Diocletian's standing types with consular dates.

A sceptre longer than those of which we are speaking appeared in the hands of M. Aurelius and Commodus respectively in some sacrificial and other scenes,<sup>23</sup> but when the Antonine emperor was shown standing or seated and holding the globe, he held also a ritual roll, not a sceptre.<sup>24</sup> The immediate predecessors of the Severi, using the type with the legend *RECTOR ORBIS*, seem not to have held the

<sup>20</sup> Nerva to Trajan, *BMCEmp.* III, p. 38, no. 53; Trajan to Hadrian, *BMCEmp.* III, pp. 236-7, nos. 1-4; 397-8, nos. 1101, 1106.

<sup>21</sup> *BMCEmp.* III, p. 269, no. 242 (receiving globe from Jupiter), cf. no. 1600, n.; p. 417, nos. 1203-5 and p. 421, no. 1236 (receiving sceptre from eagle),

<sup>22</sup> *BMCEmp.* III, p. 21, \*; p. 38, \*.

<sup>23</sup> *BMCEmp.* IV, p. 505, 792: pl. 69, 15 (A), M. Aurel.; p. 741, 281: pl. 98, 4, Commodus. On the sceptre in general, Alföldi, "Insignien und Tracht der römischen Kaiser," *RM* 50 (1935), pp. 110-117, and on the short sceptre in particular, pp. 113-14.

<sup>24</sup> For Antoninus Pius, see n. 19 above; for Commodus, *BMCEmp.* IV, p. 724, 192: pl. 95, 20.

sceptre, but the roll. The transition to a type with the short sceptre seems to have come in the reign of Septimius Severus, not for the Emperors (Severus and Caracalla) themselves, but for Geta as Caesar, therefore before he was made Augustus in 209. The coin type to which I refer is dated, a fact to which we shall return. The coins bearing the type show Geta, called Caesar in the obverse legend, togate, holding globe and short sceptre.<sup>25</sup> This is a new type created by a slight change in detail.

This substitution of the sceptre for the ritual roll by Geta is a noteworthy example of a general trend toward the increased use of the sceptre. The part played by the sceptre in the ritual of the period is illustrated by the text of the Severan *Acta Saecularia*, records of the Secular Games inscribed in stone and still preserved in Michelangelo's cloisters at the Museo Nazionale delle Terme built in the ruined walls of the Baths of Diocletian.<sup>26</sup> The sceptre of this ritual can also be seen on the coins. At this festival in A.D. 204 Geta as Caesar shared with the Augusti, his father and brother, the assumption of the ivory sceptre (*scipio eburneus*) during the rites described in the *Acta*.<sup>27</sup> This, and his assumption while still Caesar of the globe and sceptre in the manner of the earlier globe and roll representations of the Antonines and the immediate predecessors of the Severi (Didius Julianus as *Rector Orbis*) betoken extraordinary honors for the young prince.<sup>28</sup> Extraordinary, that is, from the point of view of tradition, not from the point of view of the present.<sup>29</sup>

<sup>25</sup> *BMCEmp.* V, pp. 274–5, nos. 586–7: “roll” for “sceptre” cf. the illus., pl. 42, 14 (*R*); p. 355, 868: pl. 52, 11 (*Æ*).

<sup>26</sup> *CIL* VI, 32329–31; P. Romanelli, “Nuovi Frammenti degli Atti dei ludi secolari di Settimio Severo (a. 204),” *Not. degli Scavi* (1931), pp. 341–45; Ch. Huelson, “Neue Fragmente der Acta Ludorum Saecularium von 204 nach. Chr.,” *Rhein. Mus.* 81 (1932), pp. 388–94; E. Diehl, “Zu den neuen Acta Ludorum Saecularium Septimiorum des Jahres 204 n. Chr.,” *SPAW* 1932, pp. 765 ff.; A. A. Boyce, “Processions in the *Acta Ludorum Saecularium*,” *TAPA* 72 (1941), text on pp. 37, 40, 43.

<sup>27</sup> Alföldi op. cit., p. 113, seems to assume that the *scipio eburneus* is properly only the eagle-tipped sceptre; of this there seems no certainty.

<sup>28</sup> Cf. with our types and Geta's role in the *Ludi Saeculares* his quadriga type of the same date (*PONTIF COS II*) where he is shown with eagle-tipped sceptre. *BMCEmp.* V, p. 275, 591 (*A*): pl. 42, 15.

<sup>29</sup> Geta's brother Caracalla had already been so exalted as to be identified with Sol (*BMCEmp.* V, p. 199, 244).

The legend encircling the type of Geta togate with globe and sceptre is PONTIF COS II. Since Geta entered upon his second consulship on January 1, 208,<sup>30</sup> the coins must have been struck for that date or after it, and before the coins which bear the legend PONTIF TR P COS II (*BMCEmp.* V, p. 359, 15, pl. 53, 8, placed in A.D. 209).<sup>31</sup> A possible date is 208 for at least some of those with PONTIF COS II, especially for those which appear to be celebrating the new consulship, if they can be dated earlier than others of the issue. Some of these PONTIF COS II coin types are clearly earlier than others, among them the strictly consular types.

Relative arrangement of this type within the whole group of Geta's PONTIF COS II coins should be possible, since it was during the use of this legend that Geta's portrait passed from beardless to bearded, as the list below and PLATES VII–VIII show, though portraits without a slight trace of beard are few. The point at which the portraiture passes from "almost beardless" to well or fully bearded can be seen in the production of the type described in *BMCEmp.* V, p. 274 as a "Genius holding corn ears" (E—G below), actually *Bonus Eventus*,<sup>32</sup> a type the continuous issue of which bridges the period of PONTIF COS II between slightly bearded and fully bearded portraits of Geta. The *Bonus Eventus* type is also the issue in the course of which we pass from clothed bust to a portrait of Geta which terminated in the bare neck, a portrait which does not appear with Geta's togate (sacrificing and consular) reverse types (A—B below). The full beard with clothed bust seems to appear first, then full beard with bare neck, the two developments not being quite synchronized. The evidence falls quite naturally into the following classification, which is clearly chronological:

<sup>30</sup> Ruggiero, *Dizionario Epigrafico* II, 2, p. 946, attested most dependably by the consular lists. Inscriptions do not appear to provide the real evidence for the beginning of Geta's second consulship in 208.

<sup>31</sup> *BMCEmp.* V, pp. 273–75; 353–55.

<sup>32</sup> *BMCEmp.* V, pp. 185, 301, 581, introd., clvii, clxi. At the beginning of Severus' reign a female *Bonus Eventus* was taken over from the coinage of Pescennius Niger but was later replaced by the type familiar from earlier coins. A representation of *Bonus Eventus* is described in Pliny, *NH* 34, 77: "et simulacrum Boni Eventus, dextra pateram, sinistra spicam et papavera tenens." A temple and a new porticus *Bonus Eventus* are mentioned by Ammianus Marcellinus (29, 6, 19). For early tradition see Varro, *RR* 1, 6; Cato, *Agr.* and *BMCRep.* I, pp. cxc and 289.



## PONTIF COS II

*Beardless or Slightly Bearded, Draped Bust*

- A. Geta togate, PLATE VII, 55, 56, 58, 62  
sacrificing over flaming tripod, holding patera and sceptre.
- B. Geta togate, PLATE VII, 57, 60–61  
holding globe and sceptre (not roll as indicated in *BMCEmp.* V,  
p. 274, 586; cf. pl. 42, 14 and no. 587, p. 275 of cat.).
- C. Geta in quadriga, PLATE VIII, 73, 74  
holding eagle-tipped sceptre. *A.* *BMCEmp.* V., p. 275, no. 591:  
“bearded”—but cf. pl. 42, 15; if 14 is not bearded, 15 is not  
bearded.
- D. Geta seated,  
with Septimius Severus and Caracalla. *A.* Poor photo in ANS  
photofile seems to show no beard. Evidence here insufficient. See  
Cohen and *BMC* note on Montague piece which fits our descrip-  
tion.

- E. *Bonus Eventus*, sacrificing. PLATE VII, 59

*Fully Bearded, with Draped Bust*

- F. *Bonus Eventus*, PLATE VIII, 63–65  
sacrificing. Not in *BMC*, but in Cohen.

*Fully Bearded, with Bare Neck*

- G. *Bonus Eventus*, PLATE VIII, 66–68, 71  
sacrificing. Continued into PONTIF TR P COS II (*BMCEmp.* V,  
pl. 53, 8).  
and PONTIF TR P II COS II PLATE VIII, 72
- H. Geta on horseback, PLATE VIII, 69, 70  
spearing fallen enemy. This type was continued under the rev.  
legends PONTIF TR P COS II (*BMCEmp.* V, pl. 53, 9) and TR P II  
COS II (*BMCEmp.* V, pl. 54, 5).
- I. Goddess with sceptre in r.,  
holding up drapery in l. over two children raising arms. *A.* Not  
indicated as bearded in *BMCEmp.* V, p. 274, 585, but is clearly  
bearded in the illustration, pl. 42, 13 and in Naville Sale Cat.  
XVIII, lot 356.

A clear picture of this portrait development along with the evolution of reverse types can be obtained by studying PLATES VII and VIII. Here the denarii of Geta have been arranged generally by obverse (portrait) type alone, passing from a beardless or almost beardless portrait to a fully bearded portrait. When this was done it was found that the two types showing Geta sacrificing and holding globe and sceptre fell into first place. The *Bonus Eventus* type took a transitional place, sharing all types of obverses but matching up chiefly with a bearded portrait. The horseman type was found to be contemporary with the fullbearded portraits of Geta on pieces of the *Bonus Eventus* type; and *Bonus Eventus* passed over into later issues bearing the date TR P II (A.D. 210; PLATE VIII, 72).

Within the period PONTIF COS II, then, the obverse portrait is the deciding factor in classification, and *Bonus Eventus* the chief reverse type. And it seems clear from our list above, if evidence unknown to me does not render it invalid, that classes A—D were devoted to publicizing Geta at the beginning of his second consulship. Since the globe-and-sceptre figure (PLATE VII, 57, 60, 61), belongs to the early group, it is difficult to avoid the conclusion that these coins were struck in honor of Geta's second consulship and that the types were therefore true consular types, i. e., festal, therefore different from the consular types of Antonius Pius, which ran through many years. The quadriga type struck in gold (PLATE VIII, 73, 74; *BMC Emp.* V, p. 275, 591: pl. 42, 15) and the earlier silver type (*BMC Emp.* V, p. 243, 443: pl. 38, 20, COS) add weight to this notion. These types must represent a *processus consularis*.<sup>33</sup>

A number of years later, at the end of his sole reign (A.D. 217), Caracalla assumed globe and spear on the coinage, but as a result of victory, and in military dress.<sup>34</sup> Both civilian (globe and sceptre) and military (globe and spear) motifs were continued in the third century; similar to Caracalla's military type is a type which became a stock type for the *Princeps Iuventutis*.<sup>35</sup> The togate figure with globe and

<sup>33</sup> Cf. Domitian's repeated use of the quadriga type COS XI, COS XIII, COS XV, COS XVI: *BMCEmp.* II, pp. 316, 329, 335, 340; COS XVII: ANS.

<sup>34</sup> *BMCEmp.* V, p. 466, no. 200 (A): pl. 73, 6.

<sup>35</sup> Cf. Alföldi, *RM* 50, pp. 116f., for comment on the *Princeps Iuventutis* and sceptre. Lack of mention of the third century is due to the fact that the princeps holds not sceptre but spear. Severus Alexander as Augustus has

sceptre continued but as a seated type rather than as a standing one, a type which had also occurred under the Antonines,<sup>36</sup> and of which beautiful examples are to be seen on an aureus of Elagabalus (PLATE VII, 53), and an aureus of Postumus (PLATE VII, 54). Diocletian used the standing togate type with globe and sceptre and he used this type more often than the seated one.<sup>37</sup> Before Diocletian this seated togate type was accompanied by a legend including the usual offices (PM TR P IMP COS), a titular *schema* which was used with many other types. One of the striking characteristics of the type as used by Diocletian is that it was accompanied by a legend comprising as its only number title the consular number used once more after a period of neglect.<sup>38</sup> This consular number was followed by PP PROCOS (Pater Patriae, Proconsul), the latter title having occurred previously in inscriptions and regularly from Septimius Severus, but not on coins.<sup>39</sup> One can hardly escape the conclusion that Diocletian was emphasizing the consulship. The legend is confined to our type. It must therefore have significance in relation to the type, and the types themselves must be consular.

Only from sometime in Diocletian's sixth consulship (296–8) and Maximian's fourth (293–6) does the sceptre seem to be a firmly established element of these consular types. On the earlier consular types the emperor held either sceptre or ritual roll (see Table, p. 25), the latter usually being invisible or seen only as the end of the roll. By the end of the reign the mints that were striking the types, Antioch and Siscia, evidently produced the globe and sceptre types exclusively (i. e., the roll had been eliminated). The evidence for Anti-

---

this *Princeps Iuventutis* type (*RIC*, pl. 4, 4; *BMCEmp.* VI, pl. 7, 178); Maximus as Caesar (*RIC*, pl. 10, 13); Gordian as Augustus, in a different position, (*RIC*, pl. 2 13f.); also Claudius (*RIC*, pl. 5, 78).

<sup>36</sup> Later examples are many: Macrinus, *BMCEmp.* V, p. 502, nos. 47f., pl. 79, 12f.; p. 521, no. 125, pl. 83, 1; Elagabalus, *ibid.*, p. 557, no. 181, pl. 88, 18; p. 606, nos. 427f., pl. 96, 9; Gordian, *RIC* IV, 3, p. 47, no. 294, pl. 4, 4; Philip, *ibid.*, p. 68, 2a, 2b and pl. 5, 16; Valerian, *RIC* V, 1, p. 50, no. 151, cf. pl. 1, 3, p. 52, no. 189; Gallienus, pp. 79, no. 122; 84, no. 201; 88, no. 259; 92, no. 310; 118, no. 22; 171, no. 455.

<sup>37</sup> See Pink's Catalogue.

<sup>38</sup> See n. 14.

<sup>39</sup> See G. Wilmanns, *Exempla* (Berlin, 1873), 940, n. 3; Sandys, *Lat. Epigr.*, 2nd ed., pp. 231f.; M. Bernhart, *Handbuch zur Münzkunde der römischen Kaiserzeit*, p. 42.

och indicates that the sceptre was substituted for the roll there in Diocletian's sixth consulship and Maximian's fourth, therefore in the year 296, since that was the only year common to both consulships.

It is not to be assumed from what has been said above that the ritual roll disappeared from Roman ritual, for the development of Roman ritual is not under discussion here but rather representations of the consular type on coins. That representations may have been conditioned by particular moments of ritual seems possible, but the choice of the sceptre for the consular representation was more likely to have been determined by the tendency to regard the imperial consular procession as a kind of triumph and the tendency of the times toward more elaborate and monarchical court ceremony. In any case the representation of the togate and sceptred figure on consular coins seems to have come from early in the third century A.D.; through repetition it became conspicuous in the gold consular issues of Diocletian and Maximian. Later it passed through another phase under Constantine when the accompanying legend reached a stage of precision that left no doubt as to the full meaning the type was intended to convey.

Aurei and solidi of the standing consul type were struck after the retirement of Diocletian and Maximian. Photographs of a number of them can be seen on the plates of Maurice's *Numismatique Constantinienne*.<sup>40</sup> The notable thing about this later consular coinage is the omission of the consular number, a fact which Maurice notes repeatedly. Exceptionally, however, Constantius Chlorus' fifth, and Galerius' sixth, seventh, and eighth consulships have been reported on Antiochene consular gold,<sup>41</sup> and Maxentius indicates his third consulship (A.D. 310) on a bronze consular processional type, i. e., with the

<sup>40</sup> 1, pl. 6, no. 15; 3, pl. 7, no. 9: Maximinus Daza, from Nicomedia and Antioch; 1, pl. 23, no. 5; 3, pl. 7, no. 15: Constantine, from Trèves and Antioch; 2, pl. 13, no. 5; 3, pl. 8, no. 3: Licinius, from Thessalonica and Antioch. Illustrations can now be seen in the recent works of P. Bruun, *Studies in Constantinian Chronology*, *NNM* 146 (1961), pls. 3, 72; 5, 66 and 79, and M. R. Alföldi, *Die Constantinische Goldprägung*, Mainz (1963), pls. 1, 19 (cat. no. 82); 5, 76 and 77 (cat. no. 130); 7, 110 (cat. no. 131); 9, 141 (cat. no. 128).

<sup>41</sup> Constantius Chlorus, *CONSVL V*, Paris (Missong, *ZfN* 7 (1880), p. 270; Galerius, *CONSVL VI*, London (Missong, p. 271); *CONSVL VII*, Vienna, Cohen, 84 (s. v. Maximian Herc.); Maurice, 3, p. 152; M. R. Alföldi, op. cit., 86; Cohen, 12 (no source given; s. v. Maximinus Daza), where "Maximinus"

Emperor in quadriga (see below). In Constantine's fourth consulship (A.D. 315) the consular number returns to the gold consular coinage. It appears then and on later consular gold of Constantine and his sons bearing the same type but with different legends, e. g., FELIX PROCESSVS preceding the consular number. This legend proves to be most illuminating for the type. It appears to have been first used by Maxentius, perhaps in all metals,<sup>42</sup> and occurred subsequently on Constantinian solidi, e. g., FELIX PROCESSVS COS IIII AVG N.<sup>43</sup> This reverse legend leaves no doubt as to the nature of the togate type with which it is linked. Not only is the type consular; it is associated with the procession for entrance upon the consulship. When we find a similar legend on a standing consular type of Maxentius (FELIX PROCESS CONSVLAT AVG N, Rome A.D. 308) as well as on a bronze quadriga type with Victory flying toward the Emperor (FEL PROCESS CONS III AVG N, Rome A.D. 310), it is clear that we are dealing with a consular *processus*, not primarily with an imperial triumph. Until we see the FELIX PROCESSVS legend on gold of Maxentius, Constan-

---

must be an error for Maximianus; M. R. Alföldi, 87; **CONSVL VIII**: cf. Cohen, 85 (s. v. Maximian Herc.); Maurice 3, p. 177; M. R. Alföldi, 88. So far as I can make out, however, the evidence cited for Galerius has not been fully tested to make certain that it refers to Galerius, not Maximian. Missong argued effectively for attributing to Galerius the BM **CONSVL VI** coin with crescent and star, and an examination of casts inclines me to believe him correct. Detailed argument, supported by photographs, is required to demonstrate Antiochene gold with **CONSVL VII** and **VIII** for Galerius, both of which Missong gave exclusively to Maximian. Maurice's attributions on pp. 152 and 177 are somewhat hesitant.

<sup>42</sup> *N*: Maurice, 1, p. 184; Cohen, 64 (Banduri); M. R. Alföldi, 134; *Æ*: Cohen, 65 (Vienna); Maurice, 1, p. 184; *Æ*: quadriga type: Maurice, 1, pp. 188f., pl. 17, 9; Cohen, 59, 60, 62.

<sup>43</sup> Constantine, *Trèves*: **COS IIII**, Bruun, op. cit., p. 108, 71; *Aquileia*: **COS IIIII**, Trau Coll. 3875 = Bruun, p. 108, 73 = M. R. Alföldi, op. cit., 131 (printed IIII; cf. her pl. 7, 110) but not "Cohen 154;" **COS VI**, Bruun, p. 108, 76; Cohen, 154; Maurice, 1, p. 328; M. R. Alföldi, 133; *Ticinum*: **COS IIII**, Naville Sale Cat. III (Evans), lot 185 = Bruun, p. 108, 72; Cohen, 152, 153; Maurice, 2, p. 253 ("Tarragone"); M. R. Alföldi, 129, 130; **COS VI** (needs authentication for Ticinum?), Bruun p. 108, 75; Cohen, 154; Maurice, 2, p. 273 ("Tarragone"); M. R. Alföldi, 133 (all based on Caylus); *Sirmium*: **COS VI**, Bruun, p. 108, 74 and 77; Cohen, 155; Maurice, 2, p. 395; M. R. Alföldi, 132; *Antioch*: **COS VI**, Bruun, p. 108, 78 and 79. Crispus, *Sirmium*: **COS III**, Cohen 72, Maurice, 2, p. 405; for the sons of Constantine, see Bruun's list on p. 107 and his discussion of their Antiochene gold on p. 63.

tine, and Crispus, with standing emperor type, our associating the *processus consularis* with the standing consular type is only an assumption based on the probabilities mentioned above (see p. 30), that is to say, the association of the togate figure bearing the globe and sceptre with a consular date when such dates had generally disappeared from the coinage; and the general restriction of the type to gold, which played a part in the largesses associated with the *processus consularis*.<sup>44</sup> The legend of the Constantinian solidi defines the type, and we can now safely, I believe, apply the legends on this consular gold to the similar gold pieces of Diocletian and Maximian, and to the types of Geta. All of the gold pieces may be considered to have been struck for the beginning of the year,<sup>45</sup> or for whatever time of the year a new consulship was entered upon by an Augustus or Caesar. (This had not been the case under Antoninus Pius; see p. 31 above). They were issued during the festival of which the chief manifestation was the triumphal procession of the ruler as consul. The coinage specifically struck for the imperial consul was a feature of the festival that no consul other than the Emperor or a Caesar was privileged to enjoy, though he performed the act of scattering largess. Perhaps we may say that the honor of the consular diptychs took the place of the honorific coinage for the ordinary consul. That there was no consulship like Caesar's was made clear at a later date by the restriction of the title to, and its annual assumption by, the Emperor alone from the time of Justinus II.<sup>46</sup>

<sup>44</sup> P. Grierson, "Solidi of Phocas and Heraclius," *NC* 1959, p. 134, doubts that consular gold was actually thrown during the consular procession. But Claudian, *De Sext. Cons. Hon.*, 605, seems to imply that such scatterings had taken place on occasion; cf. *Cod. Iust.* 12, 3, 2 and 3, and esp. *Nov.* 105, 2, 1: "aurum spargere," "aurum enim spargere revolvatur imperio." For representations of the largess, whether literal or symbolic, see Maurice 1, pl. 15, 4; 2, pl. 16, 15; Pearce, *RIC* 9, pl. 11, 1; J. M. C. Toynbee, *Roman Medallions*, *NS* 5, pl. 2, 5-17, pl. 3, 1-3, pl. 20, 7. Cf. Belisarius' consular procession, Procop., *Hist. of the Wars*, 4, 9, 15-16. Representation of *Liberalitas* as an institution seems to have disappeared from coins under Diocletian (cf., however, the goddess on coins of Constantine, Cohen, 316; Pauly-Wissowa, *RE*, s. v. *Liberalitas*, col. 19; list on pp. 87-88; Liberality scene on coin of Carinus, Cohen, 48.

<sup>45</sup> Pink, p. 2, evidently thinks the aurei were not occasional but, as in the second century, could have been struck within the current consular date until the next consulship.

<sup>46</sup> Pauly-Wissowa, *RE*, s. v. *consul*, col. 1137.

## A NEW SOLIDUS OF THEODOSIUS II AND OTHER VOTA SOLIDI OF THE PERIOD

### *The Imperial Vows*

"The normal form of Roman prayer was the 'votum' or vow—the petition for a specific favour, accompanied by the promise to pay a specific due, if and when the favour was granted. 'Do ut des' was the thought underlying. There were two critical moments in each vow—the moment when the vow was formulated ('susceptum', 'nuncupatum') and the moment when it was paid ('solutum'). The only sacrifice accompanying the 'nuncupatio' would be the offering of incense or libation at an altar; at the 'solutio' the promised victim would be brought to the altar for sacrifice. On both occasions the proper formula would be recited to the accompaniment, it might be, of lyre or pipe.

"Apart from the endless mass of private vows there were very many vows of an official character ('vota publica')—vows for the Emperor, for his salvation or safe return, vows for marriages, births, or adoptions in the imperial house, vows for the State—the senate and people of Rome. Each year had its special day reserved for the annual vows (3 January—'votis'). At the end of every ten years (later, every five) of a reign the vows taken at accession would be paid and carried forward again with special emphasis and display."

—H. Mattingly, in "The Imperial 'Vota'," *Proceedings of the British Academy*, Volume XXXVI, p. 155.

Theodosius I reigned from January 19, 379 to January 17, 395. His sons Arcadius and Honorius, born in 377 and 384, were associated with their father's rule as *Augusti* from January 19, 383 and January 23, 393 respectively. After the death of Theodosius in 395 Arcadius reigned in the East with his capital at Constantinople and Honorius reigned in the West with his capital first at Mediolanum, and, from 402, at Ravenna. Rome remained in the background, the mother capital whose Senate never forgot her glorious past.

Honorius had no heirs. Theodosius II, son of Arcadius, was born in April, 401 and became Augustus when less than a year old, on January 10, 402. Evidence for the public celebration of the vows of these emperors, observed with particular festivity at ten-year inter-

vals, shows that the years of their reigns must indeed be counted from the time when they became Augusti and not from the year of the death of their fathers.

Galla Placidia was the young half-sister of Arcadius and Honorius. Her son Valentinian III, born from her marriage (A.D. 417) to Honorius' general Constantius III, who became an Augustus with Honorius in the West for something short of a year (A.D. 421), succeeded to the throne in the West after the short reign of Johannes (Tyranus). Johannes had stepped into the breach caused by the death of Honorius in 423 after Galla Placidia and her son had taken refuge at the court of Constantinople following a disagreement with her brother. Valentinian was brought back to Italy by his mother and was crowned in Rome toward the end of 425 (October 23). He was assassinated in March, 455, after a long reign at the end of which he celebrated the completion of this thirty-year vows.

The division of the Empire by Theodosius between his two sons resulted alternately in periods of harmony and discord between East and West from A.D. 395, the relation being conditioned until 408 largely by the belief of Theodosius' able general Stilicho—a man panegyricized by the poet Claudian—that the regency of the whole Empire, not just of the West under Honorius, had been entrusted to him; and, simultaneously, by the efforts of the ministers of Arcadius in the East to rule independently of Stilicho's claims. Stilicho worked for the principle of a unified Empire until the years just before his downfall in 408 when he was preparing for a showdown with the East by force of arms. After Stilicho's downfall other factors worked for harmony or discord, e. g., the dispatch of military aid from the East (now under Theodosius II) during the invasion of Italy by Alaric in 410; the refusal of the eastern court to recognize Constantius III as Augustus in 421. Solidi struck for vota celebrations reflect these tendencies. Indeed vota solidi of the period inspired lines of Claudian (*In Rufinum*, II, 341f.) describing the climax of the conflict between Stilicho and Rufinus.

The concept of harmony, *Concordia*, inherited from earlier reigns, appeared occasionally on coins of the time of the successors of Theodosius I, under whom it has been particularly associated with the vota solidi. For unity of the Empire was not abandoned as a concept



under the divided rule, though it appears that the older Emperor regarded himself the senior in authority if the question came to an issue. The traditional decennialian, vicennialian, and tricennialian vows of the emperors are represented on a number of solidi of this period—the end of the fourth century and the first half of the fifth. It was in this half-century that the vota coinage had its last great floruit and came to an end. The vota solidi disappeared and the vota numbers on other denominations were often carelessly or ambiguously rendered. The cross had already supplanted vota numbers on some small denominations. There exists a great deal of detailed comment on the political and religious history of the period in the writings of historians, church fathers, imperial poets, and panegyrists. Apart from its legal and general historical importance, the Theodosian Code serves as a useful reference for the whereabouts of the emperors at given times, for the gold-producing section of the mint often followed the Court. Little mention will be made in this study of the sources or general histories which tell how conflict between pagan and Christian, persecution of pagan and heretic, maneuvering and invasions of barbarian, and constant drama between West and East mark the times.<sup>1</sup> The purpose of this paper is to present a new vota solidus of Theodosius II and to attempt to date it and then to study and date other vota solidi before the death of Valentinian III. The paper closes with an account of the decline and end of the vota coinage.

### X/VOT/XX

The coin under discussion is a solidus which was purchased by the American Numismatic Society late in 1952. It is my purpose to call attention to and study in its peculiar historical background this rare and practically unknown vota solidus. The coin belongs to the early part of the fifth century A.D., when Honorius was emperor in the West and the regents of his young nephew Theodosius II controlled the East.

<sup>1</sup> For general and detailed background material the monumental work of A. H. M. Jones, *The Later Roman Empire 284–602* (Oxford, 1964) is now available and E. Stein, *Historie du Bas-Empire* I, ed. J. R. Palanque (1959) with a second set of notes, is likewise indispensable. The expected publication of new volumes of *RIC* will present a comprehensive survey of the numismatic material of the 4th and 5th centuries.

The description is as follows:

*Obv.*: DNTHEODO SIVSPFAVG. Helmeted diademed head of Theodosius facing three-quarters r., spear in r. hand, shield, showing horseman spearing fallen foe, on l. arm. Reel border.  
*Rev.* CONCORDI AAVGG<sup>2</sup> On shield, X/VOT/XX

Constantinopolis seated facing, helmeted head r., on throne, spear resting on throne and held in her r. hand, shield resting on throne and supported at top by her l. hand. To l. of r. foot, prow. In l. field, star.

21 mm. 4.47 gm.

PLATE IX, 75

At the time of the acquisition of the coin, I had not seen any record of a coin of this sort. No solidus recording X VOT XX was known to Mattingly<sup>3</sup> when he compiled his comprehensive list of vota coins nor to A. Voirol<sup>4</sup> in his study of the Theodosian coinage. But recently I have seen in the British Museum a cast of a similar piece at Budapest, officina S, and another solidus, officina Γ, appears in Lafaurie's publication of the Chécy hoard in J. Gricourt, et al, *Trésors monétaires et plaques—boucles de la Gaule romaine, Gallia, Suppl.* 12, Paris, 1958, pl. II, 13. And in a Cahn Sale Catalogue (80, Feb. 27, 1933, lot 998) there appears a similar Constantinopolitan gold piece of Honorius (PLATE IX, 76) except that the vota recorded are XX/VOT/XXX and the officina letter is I, while the officina letter on the solidus of Theodosius is E. The solidus of the Cahn sale is now in the British Museum; another specimen, also officina I, is reported at Vienna. The two types of solidi (X VOT XX and XX VOT XXX) seem to be companion pieces struck at Constantinople early in the reign of Theodosius for himself on the one hand and his uncle and western

<sup>2</sup> Close examination of the letters reveals AVGG<sup>E</sup>, not AVGGG. Cf. J. W. E. Pearce, "The Vota Legends on the Roman Coinage," *NC* 1937, p. 115, where he discovered that he could consider as normal a "monstrosity" by reading AVGGGE rather than AVGGGG. CONOB in the exergue and the style indicate Constantinople as the mint.

<sup>3</sup> H. Mattingly, "The Imperial 'Vota'," *Proceedings of the British Academy*, 36, pp. 155-95; 37, pp. 219-68.

<sup>4</sup> A. Voirol, "Münzdokumente der Galla Placidia und ihres Sohnes Valentinian und Versuch einer Chronologie der Münzprägung unter Theodosius II (408-450)," *Verhandlungen der Naturforschenden Gesellschaft in Basel* (1945), Bd. LVI, 2, pp. 431-45.

colleague on the other.<sup>5</sup> They must, quite apart from any meaning the vota inscriptions have for us, have been struck after the accession of Theodosius II in 402 (January 10) and before the death of Honorius in 423 (August 15).<sup>6</sup> Since Theodosius died in A.D. 450, this limits the date of issue to the first twenty-one years of a forty-eight year reign; and since there seems to be no piece of Arcadius to go along with the pair, we may venture to suppose that these solidi are to be dated after 408 when Arcadius died. If therefore X (VOT X) is anticipatory of Theodosius' decennalia, it is so only by a few years, since January 10, 411—January 9, 412 would be the decennialian year. But these coins of Theodosius and Honorius may well represent issues for the actual decennialian celebration of Theodosius and the vicennalia of Honorius.

That these similar Constantinopolitan issues of Theodosius and Honorius were a pair struck for synchronous celebrations of the decennalia of the former and the vicennalia of the latter seems certain from the statement of Marcellinus Comes (Mommsen, *Chron. Min.* II, p. 70) that in the year A.D. 411 Theodosius celebrated his decennalia<sup>7</sup> and Honorius his vicennalia (*Theodosius junior decennalia, Honorius Romae vicennalia dedit*).<sup>8</sup> Honorius' vicennalia were actually

<sup>5</sup> Miss Toynbee has by a similar method identified a gold medallion as belonging to Theodosius I in "Two New Gold Medallions of the Later Roman Empire," *NC* 1940, pp. 9-23.

<sup>6</sup> Evidence for dates can in general be found in the following entries in Pauly-Wissowa, *RE* 8 (1913), s. v. *Honorius*, cols. 2277-2291; 20<sup>2</sup> (1950), s. v. *Placidia*, cols. 1910-31; 7A, 2 (1948), s. v. *Valentinianus III*, cols. 2232-59. See also O. Seeck's *Regesten der Kaiser und Päpste für die Jahre 311 bis 476 n. Chr.* (Stuttgart, 1919). Of primary sources for dates see particularly the chronographers whose lists are published in Mommsen's *Chronica Minora* of the *Monumenta Germaniae Historica*.

<sup>7</sup> In January of 411 Theodosius entered upon the tenth year of his reign. O. Seeck, *Regesten*, pp. 320f., assumes that the celebrations took place on the accession days, January 23 for Honorius, January 10 for Theodosius.

<sup>8</sup> So far as I know, there are no special festal issues with these vows comparable to the "consular" issues discussed below. These could have existed for Theodosius, who entered upon a new consulship (III) in 411, but not for Honorius. We have in Marcellinus' statement evidence that Honorius was in Rome for the celebration. The evidence is of particular value since the year 411 is an especially obscure one. We know that Galla Placidia was in Rome at the time of its sack by Alaric in 410. The Emperor's presence and festival in 411 appear to indicate that it was at this time more important to celebrate the fulfillment of the vows in the old Capital on the Tiber than at Ravenna, where, eleven years

due only in 412.<sup>9</sup> But events had occurred which may have made it seem expedient to advance the festival a year and to celebrate it in Rome. In 410 Honorius' position in Ravenna had been saved with the help of a small but effective contingent of troops sent from the East against Attalus who had been wearing the purple at Rome under the patronage of Alaric. After the fall of Attalus came the famous Sack of Rome. The early celebration of the vota in the unfortunate city in the presence of the legitimate Emperor may then have been a matter of morale. This was a period of cordiality between the Emperors of East and West, and this cordiality found expression in simultaneous, if not joint, vota celebrations. The legend *CONCORDIA AVGG* on these solidi, then, describes a reality given concrete expression in simultaneous fulfillment of the vows. From this point of view it is significant that the next vota advertised by Theodosius on solidi (*VOT XV MVL XX*) were recorded on a shield held not by a single city-goddess, but, by both Constantinopolis and Roma as under Constantius II, when the type was new, and as more recently, under Valentinian I and Valens.<sup>10</sup>

Our solidus of Theodosius II adds to the list of types given by Voirol, and a place must be found for it in his chronological scheme. Voirol's first four types are as follows:

1. *CONCORDIA AVGG*. Seated Constantinopolis holding Victory on globe.

---

later, Honorius' tricennalia were celebrated (see pp. 53-58). Since at the later festival a point was made of holding a triumph over Maximus at the same time, the Roman vicennalia may have been conceived as a thanksgiving that the Goths had not remained in possession of the city after their ravages of the previous year.

<sup>9</sup> The date of his accession was January 23, 393 (Pauly-Wissowa, *RE*, s. v. *Honorius*., col. 2278.

Year	1	Jan. 23, 393	—	Jan. 22, 394
	11	403		404
	21	413		414
	20	412		413

<sup>10</sup> Valentinian I: Pearce, *RIC IX*, p. 276 and pl. 13, 3; Valens: Voirol, op. cit., abb 11; *GLORIA ROMANORVM, VOT X MVL XX*: an enlarged photograph of this type can be seen in S. L. Cesano, "Un nuovo medaglione aureo di Teodosio I e la figure di Constantinopolis," *Studi di Numismatica I* (1940), p. 76, fig. f. On the solidi of Constantius II, Constantinopolis wore a turreted crown, but on the solidi of Valens she had, like Roma, assumed the helmet.

2. GLORIA REI PVBLICAE. Seated Constantinopolis and Roma. VOT XV MVL XX
3. VICTORIA AVGGG. Standing emperor (western issue).
4. VOT XX MVLT XXX. Victory with long cross.

It must be stated here that Voirol's numbers in his chronological scheme have reference only to the coins of Theodosius, while our system of numbering includes similar coins of Honorius. The relative position of our solidus in Voirol's scheme is easy to determine. Voirol's no. 1 is a type familiar from the reign of Theodosius I, except that on the coins of the latter no Victory stood on the globe in the hand of the goddess. Voirol's no. 2 is a vota coin of the type mentioned above (Plate IX, 77), and several factors make it certain that the ANS piece falls just before it. For one thing Voirol's no. 2 (77) bears the vota inscription VOT XV MVL XX. No one can deny that the mention of VOT XV, whether it means vows anticipated (*suscepta*) or completed (*soluta*), must follow the mention of X in comparing the two inscriptions X VOT XX and VOT XV MVL XX, since we are dealing with one denomination, the solidus, and one mint, Constantinople. The full purport of this remark—a remark seemingly unnecessary—is not easily understood until one has grasped the complications of the vota records, for instance the fact that different systems (quinquennial and decennial) of recording the vota occurred on different metals or denominations and at different mints, and that sometimes the vows named on a coin are those of the colleague of the emperor whose name appears on the obverse, not his own.<sup>11</sup> A further comparison,

<sup>11</sup> If I am not mistaken this potential flexibility of the vota-usages on coins has not been sufficiently considered by those who have worked on the coins of the Theodosian period following the death of Theodosius I. The late J. W. E. Pearce called our attention to this aspect of the earlier Theodosian vota coinage on enough occasions to make us suspicious of literal interpretation of vota inscription in relation to imperial portrait. In addition to his remarks on pp. xxxvii–xxxviii and passim in the introductory discussions to the several mints of vol. 9 of *The Roman Imperial Coinage* (1951) ed. Mattingly, Sutherland and Carson; see "The Vota-Legends of the Roman Coinage," *NC*, 1937, pp. 112–23, "The Gold Coinage of the Reign of Theodosius I," *NC*, 1938, especially pp. 222–225, 238–40; *Addendum*, *NC*, 1939, pp. 167f., and the portion of E. A. Sydenham's Presidential Address before the Royal Numismatic Society summarizing Pearce's work, "Proceedings," *NC*, 1940, pp. 19f. When

of general type, between Voirol's no. 2 and our solidus (i.e., between 77 and 75) shows that this new solidus must come first, for its type continues a type familiar from the reigns of Theodosius I and Arcadius, Constantinopolis with helmet and position of Roma; while Voirol's no. 2, Constantinopolis and Roma holding a shield between them, is clearly a revival of a type which had been in use from Constantius II to Valentinian I,<sup>12</sup> but was replaced under Theodosius I by the single figure of one of the goddesses, foot on or beside prow, therefore Constantinopolis, but facing r., as Roma had faced on the old two-goddess type, with shield bearing a vota inscription. This single figure is the type on our new solidus; Voirol no. 2 represents a revival of the old Roma-Constantinopolis type, its obverse being distinguished by the young helmeted head of Theodosius II in profile. This development, the revival of the type with the two goddesses, is further evidence of cordiality between the young Theodosius and his uncle Honorius at the time solidi of this type were issued. It was evidently the last time the two goddesses appeared together on Constantinopolitan solidi (J. M. C. Toynbee, *Stud. Pres. to D. M. Robinson* II, St. Louis, 1953, pp. 269-70)

The typology, then, as well as the vota inscription and the lack of a similar piece of Arcadius, all combine to place our solidus of Theodosius II after Arcadius' death and before Voirol no. 2 (our no. 77) with VOT XV MVL XX. Voirol no. 1 (CONCORDIA AVGG with enthroned Constantinopolis holding Victory on globe) is a type continued from the reign of Theodosius' father Arcadius. It does not occur again in the coinage, for the Victory on the hand of Constantinopolis was soon to give way to the *globus cruciger*, and there seems to be no reason for considering it anything but the earliest coinage of Theodosius II. Voirol no. 2 (our 77) recorded later vows and revived

in the middle of the third century a short reign like Aemilian's produced sestertii advertising the *decennalia* (PLATE XIV, 135) and in the fourth century Jovian (PLATE XIV, 136) and Eugenius struck coins with VOT V MVL X, it is clear that all figures involved refer to vows undertaken (*suscepta*) and not fulfilled (*soluta*). A conspicuous example of vota numbers (VOTIS V MVL X) that were wholly anticipatory within the reign of Honorius appears on silver of Constantius III, whose entire reign lies within the year A.D. 421. <sup>12</sup> The only examples of the type on the plates of Pearce, *RIC* IX, *Valentinian I—Theodosius I*, are pls. VIII, 11 (Arcadius) and XIII, 3, VOT X MVL XX, of Valentinian I.

the "two-goddesses" reverse type revealing a new cooperation between the East and the West which the joint vota coinage of our nos. 75 and 76 foreshadowed. Our new solidus lies between Voirol nos. 1 and 2 and is to be dated between 408, when Arcadius died, and 411, when Theodosius celebrated his decennalia, Honorius his vicennalia. Very probably the coins of this issue were struck in the course of the year 410, perhaps just before the festival of 411.

#### OTHER VOTA SOLIDI OF THE PERIOD

The vota numbers on coins do not always refer to the vows of the emperor whose name and "portrait" appear on the obverse.<sup>13</sup> The first vota solidi of Arcadius record not his own vows but the vows of his father Theodosius I, VOT V MVL X, whereas we find Arcadius' own first vows recorded with the same formula as on the coins of his father.

The following table based on the studies of J. W. E. Pearce<sup>14</sup> will suggest the difficulty faced by anyone picking up a single solidus of the sort under discussion. Reverse legends with AVGGGG (= 4 Augusti) belong to the brief period before Arcadius' accession (January, 383) when Gratian was still alive. AVGGG (= 3 Augusti) indicates the period after Gratian's death (August, 383).<sup>15</sup>

#### SOLIDI WITH VOT V MVL X OF THEODOSIUS I

*Rev. Detail:* AVGGGG Throne with lions' heads.

Struck separately by Theodosius I and Arcadius. Pearce, *NC* 1939, pp. 203f. and pl. XI, 9-12: "Group IV B," Jan. 19, 383-Jan. 18, 384 (p. 206).

*Rev. Detail:* AVGGG Throne with lions' heads.

Struck by Theodosius I. Pearce, pp. 205f. and pl. XII, 4-5: "Group V B," Jan. 19, 383-Jan. 18, 384 (p. 206).

<sup>13</sup> See n. 11. According to Pearce, vota numbers were manipulated by Theodosius I so that Valentinian II, actually senior Augustus, should not appear to advantage over Theodosius or his sons (see e. g., Pearce, *RIC* 9, pp. xxxviii, 73, 267, 297).

<sup>14</sup> *NC*, 1939, pp. 203-10; cf. his section on the mint at Constantinople in *RIC* 9, pp. 205, 224f., 231 and on Mediolanum, pp. 73 and 77; but cf. Ulrich Bansa, *Moneta Mediol.*, pp. 61-72 and Lafaurie, "Trésor de Chécy," *Gallia. Suppl.* 12, pp. 285-6.

<sup>15</sup> The evidence for the change from AVGGGG to AVGGG can be found in Pearce, *RIC* 9, where the coinage of this period is listed under the several mints.

SOLIDI WITH VOT V MVL X OF ARCADIUS

*Rev. Detail:* AVGGG Plain throne.

Struck separately by Arcadius and Theodosius I. Pearce, p. 208 and pl. XII, 8–10: "Group VI B," Jan. 19, 387–Jan. 18, 388 (pp. 209–10). PLATE IX, 78–80.

SOLIDI WITH VOT X MVLX XV OF THEODOSIUS I

*Rev. Detail:* AVGGG Plain throne.

Struck separately by Theodosius I and Arcadius. Pearce, p. 208 and pl. XII, 11–14: "Group VI C," Jan. 19, 388–. PLATE IX, 81.

Pearce discussed these coins in *Transactions of the International Numismatic Congress, London, 1936*, pub. Lond., 1938, p. 238, and catalogued them in *RIC IX*, pp. 222–5, no. 47; p. 230, no. 68; p. 231, nos. 70 and 71. Nos. 78–81 (PLATE IX) seem to fit into Pearce's classification, but with two reservations; no. 79 (VI B in Pearce) has a pearl diadem, whereas Pearce says that in this class Arcadius wears only a rosette diadem. This apparent divergence seems to me of no consequence because in all other classes listed above Pearce indicates that Arcadius wears either pearl or rosette diadem. No. 81 seems to show a throne with lions' heads, though the representation is crude.

Pearce regarded the vota solidi listed here as having been struck for the fulfillment of the various five-year regnal periods represented by the first of the two vota figures in each case: V (Theodosius I), then V (Arcadius), and finally X (Theodosius I) for the last group. This interpretation must be correct, since vota issues struck by Theodosius alongside issues of Arcadius similar in details of style as well as in respect to vota numbers could not have been struck before the accession of Arcadius in 383. Since Theodosius' accession year was 379, his first quinquennium year was identical with the accession year of Arcadius, a fact which is hardly due to coincidence. The two associated vota numbers—V and X or X and XV are not then anticipatory, as they had sometimes been in the third and fourth centuries, but only the second of the two is anticipatory. This follows tradition; the first figure represents *vota soluta*, the second, *vota suscepta*.

Arcadius' next vows on eastern solidi are XX/XXX,<sup>16</sup> merely the  
<sup>16</sup> VOT X MVLX XV were recorded on semisses (A). VOT V MVL XV (Sabatier 14) in Mattingly's list (127c) must be an error of Sabatier's for VOT X MVL XV. Also VOT X MVL?XX and VOT XV MVLX XX on two exceptional western solidi at Budapest (*RIC* 9, pp. 112–113; 132, no. 60) and BM (Pearce, *The Roman Coin-*



figures without the words VOT or MVLТ. They are inscribed on a shield by a seated Victory encircled by a legend new to the Roman coinage: NOVA SPES REI PVBLICAE (PLATE IX, 82).<sup>17</sup> There is no reason why vows accompanied by such a legend should refer to anyone but Arcadius himself and his family, for this legend is clearly dynastic. The figure of Spes holding a flower and raising her skirt had since the reign of Claudius appeared on the coinage as a symbol of the fertility and the succession of the imperial family. Arcadius' vicennial year was 402/3 and in January 402 Arcadius proclaimed his son Theodosius (II) Augustus. Within a year's time Arcadius had had a son and had made him nominal co-emperor. It can hardly be doubted that the solidi bearing the legend NOVA SPES REI PVBLICAE were struck to celebrate jointly the vicennial year of Arcadius and the proclamation of the child Theodosius as Augustus.<sup>18</sup>

When we come to the vows on solidi of Honorius we find the Emperor's own vows, to be sure, but there is also a clear case where the vows of another occurred on solidi with Honorius' "portrait." In the West while Arcadius was still alive vota solidi were issued at Mediolanum for Honorius' decennalia (Ulrich-Bansa, *Moneta Mediol.*, pp. 197, 396, pl. VIII, 80, A.D. 403), but with these we are not concerned here, since they seem not to involve an "East-West" problem. The later vows on solidi of Honorius are XX VOT XXX (PLATE IX, 76, see pp. 43-48); VOT XX MVLТ XXX (PLATE IX, 83), both on Constan-

age from A.D. 364 to 423, p. 18, no. 19). J.P.C. Kent kindly informs me that apparently the engraver originally intended to write X and not XV on the latter.

<sup>17</sup> Sabatier I, pl. III, 12; Tolstoi, pl. I, 28; Ratto, pl. II, 49, 50; Goodacre, p. 24, no. 17.

<sup>18</sup> It is my conviction that study of large numbers of coins of this period (including Eudoxia's SALVS REI PVBLICAE solidi) will eventually indicate that the date of these coins is 402 or close to it. Analysis of the reverse legend NOVA SPES REI PVBLICAE suggests such a date now. In the legend, NOVA seems to eliminate any other date such as 397/8 suggested by Mattingly ("The Imperial 'Vota'," Pt. 2, p. 250), who assumed that the coins were struck immediately after Arcadius' third quinquennium (VOT XV) and thought the legend referred to Arcadius as successor to Theodosius I after the death of the latter in 395. The wedding of Arcadius and Eudoxia is close to this date; the birth of Theodosius II (April, 401) is close to our date, 402. In the light of the tradition linking dynasty or heir with Spes the idea of succession is certainly in NOVA SPES REI PVBLICAE. NOVA seems to me definitely to eliminate Arcadius, who at the time of Theodosius' death in 395 had been an Augustus for a dozen years, since 383.

tinopolitan issues; and VOT XXX MVLТ XXXX (PLATE IX, 84, 85) appearing on Ravennate issues.

<i>Vota</i>	<i>Mint</i>	<i>Rev. Type</i>	<i>Obv. Type</i>
PLATE IX, 76 XX VOT XXX (of Honorius)	Constantinople	Constantinopolis seated on throne, helmeted head r., sceptre in r., in l. shield resting on arm of throne and bearing vota inscr. At r. foot, prow.	Facing bust of Honorius, helmeted head three-quarters r., spear in r., horseman shield in l.
PLATE IX, 83 VOT XX MVLТ XXX (of Theod. II)	Constantinople	Victory three-quarters facing, head l., holding long cross resting on ground in r.	Similar.
PLATE IX, 84 VOT XXX MVLТ XXXX (of Honorius)	Ravenna	Two helmeted goddesses seated r. and l. on cuirasses, holding between them a shield bearing vota inscr.	Facing helmeted and diademed head of Honorius, short spear in upraised r., held in front, on l. shield on which christogram.
PLATE IX, 85 VOT XXX MVLТ XXXX (of Honorius)	Ravenna	Honorius, clad in festal toga, seated facing, on curule chair, holding mappa and eagle-tipped sceptre.	Diademed and bearded bust of Honorius clad as on rev. facing, mappa in upraised r., eagle-tipped sceptre in l.

No. 76 was a companion piece to no. 75. (X VOT XX of Theodosius II) and was struck by Theodosius II for the celebration in the same year of his own decennalia and the vicennalia of Honorius, A.D. 411, according to Marcellinus Comes (*Mommsen, Chron. Min.* II, p. 70). No. 83, though having the same vota numbers as no. 76 (XX

4•

and XXX) cannot be of the same date, for no. 83 clearly belongs to the vota coinage connected with the vicennalia of Theodosius II (victory holding long cross, VOT XX MVLT XXX), the abundant long cross coinage struck over a period of time for Theodosius II, his sister Pulcheria, his wife Eudocia and his aunt Galla (Aelia) Placidia. The vota legend on the long cross coinage of this whole family can refer only to the eastern emperor Theodosius II, as de Salis had recognized in 1867.<sup>19</sup>

The striking of no. 76 with the vows of Theodosius but in the name of Honorius represents a traditional courtesy gesture which the eastern court extended to the West. These complimentary coinages were often issued in small numbers; yet it is puzzling that but two specimens of the long cross / VOT XX MVLT XXX coinage issued for Honorius are known to me—from sales catalogues.<sup>20</sup> It may be that history has an explanation worth considering. The long cross coinage was first issued in the East at about the time when in the West, Honorius made his brother-in-law Constantius a co-ruler with the title *Augustus* (421). Constantius III, who had been married to Galla Placidia since 417, was not recognized as Augustus by the eastern court. Philostorgius (12, 12) tells us that Theodosius did not accept the images of Constantius sent to the eastern court and that Constantius made preparations for war. The immediate issue was closed by his death in the same year. It is therefore possible to suppose that differences between Honorius and Theodosius over the recognition of Constantius III may be reflected in the scarcity of long cross issues for Honorius. The long cross issues of Placidia, probably struck after her flight to Constantinople, appear to have been more numerous than those of Honorius. Whether or not this coinage reflects differences over dynastic affairs between East and West, one thing is certain; that the transplanting and development of the long cross coinage in the West, where the coinage modelled on Theodosius' type had a long history, was the result of Theodosius' support of Placidia and her son Valentinian. Valentinian's reign in the West came not through his uncle Honorius, from whom Placidia and her

<sup>19</sup> "The Coins of the Two Eudoxias, Eudocia, Placidia, and Honoria, and of Theodosius II, Marcian, and Leo I, Struck in Italy," *NC*, 1867, pp. 203–15.

<sup>20</sup> Santamaria, Jan. 24, 1938, lot 1058 and *Münzen und Medaillen*. Jan. 1960, lot 46.

son fled nor through his father Constantius III, who died after a short reign in 421, but through the tardy support given Placidia by the court at Constantinople. The date of no. 85<sup>21</sup> should be certain because it combines vota numbers with festal types. The obverse and reverse types make it clear that the solidi represented here by no. 85 were issued for an occasion. On both sides the Emperor is represented as triumphator and/or consul. He wears the triumphal garb, he sits on the curule chair, and he holds the mappa in his upraised hand, ready to give the signal for the start of the games, and the eagle-tipped sceptre in his left. Except for the fact that it lacks a nimbus surrounding the Emperor's head, the representation is similar to that on solidi linked with the celebration of Honorius' fourth consulship in 398 (Ulrich Bansa, *Moneta Mediol.* pl. IX, 87; pp. 199, 201). The present occasion can be no other than the celebration of the vota mentioned in the reverse legend, VOT XXX (the word MVLT shows clearly that VOT XXXX are anticipated here). Honorius' thirty-year vows were celebrated in 422.<sup>22</sup> This then is the date of no. 85; just possibly the coins were struck at the end of 421 in anticipation of the festival.

More than vows were involved in this celebration—a new consulship and a triumph. Honorius entered upon his thirteenth consulship in 422.<sup>23</sup> And we are expressly told that he took the occasion of the

<sup>21</sup> The consular type, no. 85 (Cohen 69) is relatively rarer than no. 84. Photographs in Hirsch Sale Cat. 29 (1910), lot 1542; Naville Sale Cat. 3 (1922), lot 245 (same die if not same coin); R. Delbrueck, *Spätantike Kaiserporträts*, pl. 19, 8 (obv. only).

The type with the two goddesses, no. 84 (PLATE IX); Hirsch Sale Cat. 29 (1910), lot 1543; Naville Sale Cat. 3 (1922), lot 246 = Ratto Sale Cat., June 7, 1926, lot 2714; Ratto Sale Cat., Feb. 8, 1928, lot 4974; Trau Sale Cat. 4645; Jameson Cat. 2, 396. Pearce, *The Roman Coinage from A.D. 364 to 423*, p. 25, no. 5, mistakenly reported a variant (Paris) with a reverse legend VICTORIA AVGVSTORVM. M. Jean Lafaurie kindly informs me that only Pearce 7, no reverse legend, exists in the Cabinet des Médailles.

<sup>22</sup> *Chron. Min.* I, p. 656, 89 (yr. 422): *Maximus tyrannus de regno deicitur ac Ravennam perductus sublimen spectaculorum pompam tricennialibus Honori praebeuit*; cf. Hydatius, *Chron. Min.* II, p. 20, 80: *Honorius actis tricennialibus suis Ravennae obiit*. Marcellinus Comes, *Chron. Min.* II, p. 75 (yr. 422): *in tricennialia Honorii, Maximus tyrannus et Iovinus ferro vincti de Hispanias adducti atque interfecti sunt*.

On conjunction of the triumph with vicennalia, etc., see A. Alföldi, *Röm. Mitt.* 49 (1934), pp. 98f., n. 1.

<sup>23</sup> See the consular lists in Mommsen's *Chron. Min.* There is nothing peculiar about a coin which celebrates a new consulship and at the same time the

tricennalian festival to celebrate victory over the defeated insurrectionist Maximus, who provided the *sublimem spectaculorum pompam*.<sup>24</sup> The coinage represented by no. 85 then celebrated a brilliant series of events at the beginning of A.D. 422. It bears the mint mark of the city where the events took place—Honorius' capital, Ravenna.

No. 84 also mentions tricennalian vows (VOT XXX MVLT XXXX) on the shield held by the two helmeted goddesses. Neither obverse nor reverse gives a hint of anything so specific as the special festal quality of no. 85; but the relative frequency of these pieces,<sup>25</sup> though they are not common, suggests that they were not a festal issue but a regular issue anticipatory of the tricennalia and struck continuously in a general period before, during and perhaps after the celebration of the tricennalia. One feature of the obverse type suggests that these coins were first issued somewhat earlier than the festal issues proper; the fact that Honorius is here shown without a beard, a feature which is clear on no. 85. The conspicuous beard appears so far as I know on only one issue of Honorius apart from no. 85—an issue which may have been Honorius' last (PLATE IX, 86; see pp. 58–59). For this reason no. 84 seems properly placed before no. 85.

The outstanding characteristics of no. 84 are the following:

*Obv.*:

- 1) Facing head of the helmeted Emperor; at this time this type had been characteristic only of the coinage issued in the eastern part of the Empire.<sup>26</sup>

discharging of the decennial vows or their multiples. A connection of the consulship, though perhaps not exactly coincident in date, with the decennalia of Severus Alexander (seated on curule chair, VOT X on shield) can be seen on a medallion illustrated by Miss Toynbee (*Roman Medaillons*, pl. 44, 5; see also Gneecchi, *Medaglioni Romani* I, pl. I, 9) and in the consular figures of Constantius Chlorus and Severus II (Maurice, *Num. Const.* 2, pl. 9, 7; Gneecchi, *Medaglioni Romani* I, pl. 5, 9), below which XX appears within a wreath.

Precedent for the type may be seen in the VOTA PVBLICA solidi of the time of Valentinian I.

<sup>24</sup> See n. 22.

<sup>25</sup> See n. 21.

<sup>26</sup> For the general style of this obv. when used in the West cf. a coin of Constantius II struck at Aquileia, O. Ulrich Bansa, *Moneta Mediolanensis* (352–498), Venice, 1949, pl. A, c. The facing head for East and profile head for West was a distinction which came into being under Arcadius and Honorius. Constantius II, who introduced the facing helmeted head type with VOT XXX MVLT XXXX on the rev., used this obv. in both East and West.

- 2) Short spear of the helmeted Emperor held in front; the only other example on solidi of the period known to me is no. 77, an issue of Theodosius II (helmeted Emperor in profile), about five years earlier than no. 84, and showing an awkward and incomplete attempt to represent the short spear.<sup>27</sup>
- 3) XP in monogram on the Emperor's shield, replacing the usual horseman spearing foe. This may have been inspired by Victory inscribing XP on a shield on solidi of the Empresses, but more probably copied a rare tricennialian solidus of Constantius II with XP in monogram on the Emperor's shield (P. LeGentilhomme, *Rev. Num.*, 1943, p. 80 and pl. I, 1). On Constantius' solidus the Emperor held the spear behind him, as usual.

*Rev.:*

- 4) Facing heads of both goddesses.
- 5) The goddesses seated on cuirasses, not thrones; on contemporary coins (semisses) Victories holding shields inscribed with vota numbers sat on cuirasses, as did Roma under the early Empire.<sup>28</sup>

<sup>27</sup> This motif, the Emperor holding the short spear in front, can be traced back (not always with helmeted head) at least to local Æ of the third century A.D. (e. g., from the Weber Coll.: Caracalla, Ancyra, 7770; Gordian III, Perga and Side, 7350, Tarsus, 7667, 7671; Philip I, Cotiaenum, 7076; Valerian, Mytilene, 5697; Gallienus, Antioch ad Menandrum, 6370). It evidently appeared a little later on imperial coins of the same century (e. g., from *RIC*: Gallienus, V, 1, pl. 12, 171 [medallion]; Aurelian, V, 1, pl. 7, 102, pl. 8, 126; Probus, V, 2, pl. 1, 10, pl. 2, 17; nearer our period, Valens, IX, pl. 1, 9; Arcadius, IX, pl. 14, 15). Note also solidi of Valentinian I and Gratian, Ulrich Bansa, *Moneta Mediol.*, pl. B, and p. 42, where the type is described as "clearly alluding to events of a military nature." There comes to mind also a later but famous example of the type—the lost medallion of Justinian (Gnecchi, *Med. Rom.* I, pl. 20, 4; *BMC* I, frontispiece; *Rev. Num.* 1899, pl. I, 2); *NS* 5, pl. 49, 3.

<sup>28</sup> Roma had since the time of Nero continued to sit on a cuirass, and under Valentinian I (Pearce, *RIC* IX, pl. 3, 1–3, *A*) she was so represented. The cuirass may be but a further indication of "westernization" of both goddesses, i. e., their assimilation to Roma by means of the cuirass as well as of the helmet. The assimilation of the type of Constantinopolis to the type of Roma may be Honorius' way of emphasizing the Roman origin of the eastern capital and the primacy of Rome. The palm on these coins is likewise western, for the palm branch had appeared on earlier western coinages (see n. 31).

- 6) Both goddesses represented alike; both goddesses wear helmets, the headdress of Roma; although on Æ of Constantine, Constantinopolis as well as Roma had worn a helmet rather than the oriental crown of towers, under Constantius II, when Roma and Constantinopolis had appeared together on the A coinage, Constantinopolis had worn the turreted crown of eastern city goddesses.<sup>29</sup> Valentinian and Valens had recently given the helmet to Constantinopolis as well as to Roma on an issue of vota solidi (see p. 45 and n. 10). Under Theodosius I, Constantinopolis (appearing alone) wore the helmet of Roma and therefore may be said to have superseded or displaced Roma. Of her attributes only the prow at her foot identifies her. Theodosius II, however, represented both goddesses with helmets on no. 77<sup>30</sup> On no. 84 the two goddesses are represented exactly alike; both wear helmets, and there is no prow beneath the foot of the goddess to our right. The goddess to the left must be Roma, in accordance with convention. The goddess to the right, her double in this case, can only be either Constantinopolis deprived of her identifying prow, or Ravenna (hardly *Virtus*, as Mattingly held, "The Imperial Vota," II, p. 263, n. 129), who, it so hap-

<sup>29</sup> The conventional eastern city-goddess on the ancient coinage was a turreted, a more literal, representation of a city. Roma, though helmeted in her own right, as we know from the tradition of the republican coinage, had long since taken her form on the coinage from the Athena on the tetradrachms of Alexander's diadochos, Lysimachus (cf. C. Seltman, *A Book of Greek Coins*, London, 1952, p. 26). Perhaps the most famous seated Roma type on coins appears on the beautiful bronzes of Nero.

On the relationship of Constantinopolis to Roma from the time of Valentinian I see J. M. C. Toynbee, "Roma and Constantinopolis in Late-Antique Art from 312 to 365," *JRS* 37 (1947), pp. 143, 144; and "...from 365 to Justin II," *Stud. Pres. to D. M. Robinson* II, St. Louis, 1953, pp. 261-77. See also the detailed analysis by S. L. Cesano, *Studi di Numismatica* I, pp. 72-77.

<sup>30</sup> On this coin (no. 77) Emperor and both goddesses are helmeted and in profile, contrary to both conventional eastern practice which represented the Emperor facing and to the unconventional (for the West) facing representation of the Emperor on our solidi of Honorius. L. Laffranchi, "Appunti di Critica Numismatica. I. La data finale della personificazione di Costantinopoli ed i medaglioni aurei del tempo Teodosiano," *Numismatica*, 1941, p. 33, mentions our solidi of Honorius briefly. Mattingly's suggestion (pp. 263f., n. 129) that the second goddess was probably *Virtus* and the Roman numerals he would require on the coins for Honorius' tricennalia seem to me quite erroneous.

pens, might also have been invested with a prow, since the city harbored an important imperial naval base. The fact that the prow is absent *suggests* that the goddess is not Constantinopolis, since if Ravenna were intended and given a prow, she would certainly *seem* in accordance with tradition to be Constantinopolis!

If the goddess to our right is Constantinopolis, she represents, with Roma, the concept of a unified Empire. This reverse, linked to a conspicuously aggressive obverse, could signify Honorius' claim, as senior Augustus, to control over the succession, since his right to choose a second Augustus had been disputed not long before these coins were first struck (see p. 52). And while the militant obverse might be taken to symbolize the triumph over Maximus, Honorius' spear might also be poised against the Eastern court.

If the goddess to our right is Ravenna, on the other hand, she is a symbol of Ravenna's rise to a claim of equality with Rome as an imperial capital, and the type is an apt compliment to the city where the triple festival (consulship, tricennalia, triumph) was celebrated. The helmeted figures here should be compared with Ravennate medallions shown on plates G, a and H, e of Ulrich-Bansa's *Moneta Mediolanensis*.

My concern with this point represents important problems—the relation of West to East and of Ravenna to Rome, and while I incline to regard the second goddess as Constantinopolis in spite of difficulties, I should like to see the way opened to a more confident decision.

- 7) Palm branch between the goddesses, a minting symbol characteristic of the Valentinian period, when it was placed between the enthroned Emperors.<sup>31</sup>

Although the details of the types of these coins derive from both remote and recent traditional features, the types taken as a whole represent a striking departure from earlier or contemporary issues.

<sup>31</sup> For the evidence consult Pearce, op. cit., p. 325, s. v. "Palm-Branch\*." On the general use of the symbol in this period as an official mark of guarantee, see Sir Arthur Evans, *NC*, 1915, p. 493.



They are novel in form and spirit and are unlikely to have been designed haphazardly rather than with meaningful intent. The Christian and aggressive elements stand out as the most conspicuous features, as if the Emperor wished to be thought of with spear poised for action rather than at rest and to show the oncomer that his buckler bore the now well known Christian symbol of victory. Like the Emperor, the goddesses face the observer. The vota are proclaimed on their shield (to the display of which all their effort is directed), the pagan counterpart to the Christian shield on the obverse. These vows (Honorius' thirtieth) are known to have been fulfilled at a festival in A.D. 422. Since we have in no. 85 the actual festal issue, this issue (no. 84) doubtless represents a general issue which announced the imminence of the votive celebration. Our coins are then probably to be dated from the latter half of 421, the year when there were differences between eastern and western courts over the naming of Constantius III, husband of Galla Placidia, an Augustus (Philostorg. 12, 12). Unless the types of this coinage have a limited reference to Ravenna and celebration for victory in the West, they may manifest the claim of the western Emperor Honorius to seniority in the rule of the whole Empire (symbolized on the coins by the two capitals) and therefore in dynastic matters, under the strength of the Christian symbol of victory XP. This then is a coinage well suited to 421, when the court of Theodosius denied Honorius' choice of Constantius III as a new Augustus and the West insisted on Constantius' position. History shows that Theodosius did not deny Constantius' son, who was also Placidia's son, the succession in the West but sent Valentinian from the eastern court, whither he and his mother had fled from Honorius, back to Italy in order to wrest imperial control from Johannes "Tyrannus" after Honorius' death in 423. Times had changed and Valentinian was of the dynasty. But opposition to Constantius in 421 was clear, and it is indeed difficult not to connect the vota coinage represented by no. 84 with the era of bad feeling between East and West just before Honorius' tricennalia which took place with elaborate celebration and triumph at the beginning of 422. As has been noted, the bearded obverse of Honorius on no. 85 suggests that no. 84 was the earlier of the two vota issues. For another regular and common issue of Honorius, very different from his other solidi in respect to

types and therefore perhaps the latest of his regular (i.e., not festal) issues,<sup>32</sup> also shows the Emperor wearing a beard (PLATE IX, 86).<sup>33</sup>

The method of recording the vows of the consular solidi, VOT XXX MVL T XXXX around the rim, is unusual for a vota legend. This is the method used on the "long cross" coinage of Theodosius II (PLATE X, 87-98) which was initiated about this time or slightly before. Honorius' circular legend may therefore have imitated the circular vota

<sup>32</sup> The substitution of a mythical animal for a conquered foe, and the new form of the cross, together with the fact that Valentinian III developed still another type from it (see pp. 66-67; 78-80;) 86 would seem to place this solidus at the end of the reign (see n. 33).

<sup>33</sup> This coin is not a vota piece but is important for the dating of the vota issues under discussion. Its date would seem, as Voirol implied (pp. 434, 441, 443), to be 421 because AVGGG on the reverse suggests a period of three Augusti, i. e., Theodosius II in the East, Honorius and Constantius III in the West. The helmet worn by Honorius might also suggest this year when the West was said to be ready for war to assert the imperial status of Constantius, were it not for the fact that the helmet on the obverse was conventional in the East and perhaps on this coin merely represented a familiar motif, possibly in imitation of the eastern coins. Honorius, furthermore, carries no weapon here as on no. 84 where an active warrior is suggested. AVGGG, however, must be accounted for, if possible, and it is true that for the latter part of Honorius' reign GGG fits only 421 if the formula has literal meaning. But has it literal meaning? That is, does it signify a period when three Augusti reigned? It is noteworthy that all VICTORIA AVGGG solidi of Honorius and all such solidi after Honorius in the West and also in the East carry on the reverse legend with AVGGG for no apparent reason. The use of VICTORIA AVGGG then became fixed in the later period of Honorius and Theodosius and lost its literal significance whereby the number of G's indicated the number of reigning Augusti. Attempts to read into the imperial formula AVGGG the women of the imperial family seem to me inevitably to fail. Since this note was written a detailed discussion of AVGGG has appeared in the publication of the Chécý hoard (see p. 43 above), pp. 285-90. Lafaurie has concluded that AVGGG has literal meaning up to the time of Johannes (423). Some would apparently date the coins with helmeted and bearded profile of Honorius early in the fifth century. Matching solidi struck for Theodosius II, Lafaurie, pl. II, 3; Hess Sale Cat. 24, Apr. 16, 1964, 382 are involved in the question of dating. In spite of the unreliability of portraiture as a criterion, especially where different mints are involved, it seems difficult to place Hess 380 (= PLATE IX, 77) later than Hess 382 (both, Theodosius II).

From what has been said here it would seem that since the helmeted profile type of Honorius, through its reverse type which was new and inspired the reverse type of Valentinian III, was Honorius' latest issue; the date may well be later than 421. Otherwise there would be no solidi to place after the vota pieces of 421/22 and it seems unlikely that no solidi were issued later in 422 and in 423, for Honorius died only in August, 423.

legend on the early long cross issues of Theodosius. This Theodosian series which we call the "long cross" coinage is by far the most significant common series in the vota coinage of the period. It was in fact a vota issue which was not only festal but had the status of a regular series.

#### THE 'LONG CROSS' SOLIDI

Solidi on which there appears a Victory holding a long cross on the ground, the whole being encircled by the legend VOT XX MVLT XXX, form an issue which inaugurated a new type in the East that spread to the West on the one hand and on the other continued to be used in eastern reigns succeeding that of Theodosius II, when the legend VICTORIA AVGGG replaced the original vota legend. The long cross on the solidi has been identified with a cross Theodosius presented to Jerusalem in the twentieth year of his reign, i.e., in the vicennial year which the coins celebrated.<sup>34</sup> One would like to know the exact date of issue for the similar types with the obverses of Theodosius II, his sister Pulcheria, his wife Eudocia, his uncle Honorius, and his aunt Galla (*Aelia* on Constantinopolitan issues) Placidia. For these coins may not have been issued simultaneously.<sup>35</sup> The date of the vicennialia of Theodosius II (the only date omitted from Marcellinus Comes' entries of vota anniversaries, see below, p. 71) should be A.D. 421 and the most likely date for the first long cross coinage that year or the end of 420.<sup>36</sup> But a recently published solidus with the

<sup>34</sup> A. Frolov, "Numismatique Byzantine et Archéologie des Lieux Saints au Sujet d'une Monnaie de l'Impératrice Eudocie (Ve siècle)," *Institut Français d'Études Byzantines. Mémorial Louis Petit*, (Bucharest, 1948), pp. 81 ff. Frolov sketched the subsequent history of the type in the East. For comment on Frolov's identification of Theodosius' gift with the cross on the coins see A. Blanchet, *RN*, 1949, p. 155; James Breckenridge, *The Numismatic Iconography of Justinian II*, *NNM* 144 (1959), p. 34, n. 28; J. P. C. Kent, "'Auream Monetam . . . Cum Signo Crucis,'" *NC*, 1960, pp. 131 f.

<sup>35</sup> Kent, *op. cit.*, p. 130, confirms that they were not.

<sup>36</sup> It is in any case impossible to date the long cross coinage "quite precisely to the year 423 A.D." (Breckenridge, *Iconography*, p. 34). Several reasons are against such a date for the beginning or duration (i. e., the limit) of the long cross coinage, particularly the fact that 423 is too late for the vicennial celebration, unless it can be proved to have been postponed for a considerable period; and the coinage need not have been struck from its inception for all the imperial persons whose portraits appeared on the obverses in the course

long cross reverse and a consular type associated with Theodosius' tenth consulship (A.D. 422) has been cited as the initiation issue for this coinage (R. A. G. Carson, "Roman Acquisitions," *NC*, 1959, pp. 15 f., pl. III, 17 and similarly in *BMQuarterly*, 1960, pp. 23 f., pl. IV, 18; PLATE XII, 113), the beginning of which, moreover, is specifically connected by a fifth century writer,<sup>37</sup> the author of the *Liber de Promissionibus et Praedictionibus*, 3, 34 (Migne, *Patrolog. Lat.*, 51, col. 832) with a victory of "Arcadius" over the Persians in a war fought for the sake of persecuted Christians: *sane nostris temporibus apud Persas persecutionem factam novimus, imperante Arcadio religioso et Christiano principe; qui ne traderet ad se confugientes Armenios, bellum cum Persis confecit. Eo signo, antequam potitus victoria, iam coeuntibus in praelium militibus, aerae cruces in vestibis parvere. Unde etiam victor auream monetam eodem cum signo crucis fieri praecepit, quae in usu totius orbis et maxime Asiae hodieque persistit.*

Since Arcadius fought no such war and struck no such coinage, his name obviously appears here in error for "Theodosius," who brought such a war to a successful close in 422 (cf. *NC*, 1960, pp. 129 f. and *Bull. de la Soc. franç. de Num.* 15 [1960], p. 421). In honor of the victory the Emperor initiated the coinage mentioned in the above-cited passage and according to the same passage the coinage continued in use over a large portion of the Empire. This description fits what we know of the surviving long cross solidi. If the initiation of the long cross coinage is to be dated to 422 in accordance with this passage, we must suppose that the outbreak of the Persian War in 421—Theodosius' vicennial year—delayed the initiation of a vicennial coinage, perhaps the vicennial celebration, though this should have taken place earlier in 421 before the outbreak of the war.

---

of its career, which de Salis dated 420–425 ("The Coins of the Two Eudoxias, Eudocia, Placidia, and Honoria, and of Theodosius II, Marcian, and Leo I, Struck in Italy," *NC*, 1867, p. 211). The surviving volume of this coinage, moreover, and the fact that it was copied briefly for Honoria in the West, point to its having been struck over a number of years in the vicennial period. See also Kent, loc. cit.

<sup>37</sup> Identified as "Quotvultdeus" writing at Carthage, 450–453. J. Heurgon, announcement in *Bull. de la Soc. franç. de Num.* 15 (1960), p. 421, of a new edition in preparation of the *Liber de Promissionibus et Praedictionibus Dei*, by M. René Braun.

It is not impossible that the author of the *Liber de Promissionibus* attributed to the Persian victory the occasion for a coin type already in use as a propaganda piece for some months before the beginning of hostilities.<sup>38</sup>

The photofile at the American Numismatic Society tends to show that the volume of the issue was the greatest for Pulcheria and least for Honorius. The list drawn from this material, which of course represents only a sampling offered in the main sale catalogues, shows the following order of frequency: Pulcheria, Theodosius II, Eudocia, Galla (Aelia) Placidia, Honorius. This may represent an unfair sampling of specimens, as further studies of larger numbers of coins

<sup>38</sup> M. Braun is said to refer the story of the new gold coin to the reign of Theodosius. M. Heurgon, however, seems to identify the solidus not with the long cross type but with the older type showing the emperor placing his foot upon a prisoner and holding a vexillum or cross. While this Ms. was in press I learned through the courtesy of M. Heurgon that R. Braun's work on Quotvultdeus has appeared in two editions, the first in the *Corpus Christianorum*, ser. Lat., 60, *Opera Quotvultdeo Tributa*, 1961; this I have not seen. But the second, Quotvultdeus, *Livre des Promesses et des Prédications de Dieu, Sources Chrétiennes*, vols. 101, 102, Paris, 1964, has become available to me. Braun has established *Liber Promissionum et Praedictorum Dei* as the title used by Quotvultdeus (I, p. 15) and dates the work within the period 445—451 A.D. (p. 18). His revised text and translation of the passage cited above (p. 61) read as follows (II, pp. 558—60): *Sane nostris temporibus apud Persas persecutionem factam novimus imperante Arcadio religioso et Christiano principe. Qui ne traderet ad se confugientes Armenios, bellum cum Persis confecit, eo signo ante politus victoriam quo euntibus ad proelium militibus aereae cruces in vestibis paruere. Unde etiam victor auream monetam cum eodem signo crucis fieri praecepit quae in usu totius orbis et maxime Asiae hodieque persistit.* Trans.: "Assurément, pour notre époque, nous avons connaissance d'une persécution qui a eu lieu chez les Perses, sous le gouvernement d'Arcadius, prince dévot et chrétien. Celui-ci, se refusant à livrer les Arméniens qui cherchaient refuge après de lui, fit la guerre aux Perses et une signe (miraculeux) lui assura d'avance la victoire: au moment où ses soldats allaient au combat, des croix d'airain apparurent sur les vêtements. Aussi après sa victoire ordonna-t-il de frapper une monnaie d'or portant ce même signe de la croix: cette monnaie reste encore en usage de nos jours dans le monde entier et en Asie en particulier." Braun discusses the difficulties of the passage and gives the reasons for his choice of readings. Besides his text, see *Introd.* pp. 69f.; 79—80. He refers among other articles (p. 70, n. 1) to Kent's "Auream Monetam, etc." (NC 1960), but on p. 559, n. 7, says the coin mentioned in the passage has not certainly been identified. Since Braun holds that "Arcadius" is a mistake for "Theodosius," this is something of a surprise, for no other coinage of the fifth century will fit the final words of the passage so perfectly as do the long cross issues.

may reveal. But there would be nothing strange in statistics which showed greater output of solidi for the eastern rulers, particularly for Pulcheria and Theodosius, and practically nothing in the name of Honorius (cf. Ulrich-Bansa, *Moneta Mediol.*, p. 239, n. 48). For Pulcheria had long been Augusta at the time of Theodosius' vicennalia, from July 4, 414,<sup>39</sup> and only he and she could properly from the titular point of view, i.e., as Augusti, and as initiators of the series, begin the series in 420 or 421 or even 422. Eudocia became Augusta at the beginning of 423,<sup>40</sup> and so presumably her coinage began at that time or later. Galla Placidia could hardly share the coinage before she reached Constantinople in 423, after having fled Italy with her son Valentinian. Her Constantinopolitan issues, which are relatively rare, probably stopped once she had returned to the West and began striking the long cross type there.<sup>41</sup> As for Honorius, his death in August 423, if nothing else, would have cut off the Constantinopolitan issues in his name. But it is more likely that the gesture of Constantinople in making him a participant in the issue was not continued, or was limited to a token issue, because of hostility resulting from the disagreement of East and West over the naming of Constantius III as Augustus in 421. Both the presence and absence of coins of Honorius in the issue are important in the dating of the long cross coinage.

The course of the early long cross coinage of Placidia in Italy, the style of which is conspicuously different from that of the eastern

<sup>39</sup> I cannot subscribe to Mattingly's suggestion ("The Imperial 'Vota'," Pt. 2, p. 267) that VOT XX MVLT XXX on the long cross coinage are vows proper to Pulcheria, however great the volume of her long cross coinage.

<sup>40</sup> Eudocia became Augusta January 2, 423 (*SHB, Chron. Pasch.* I, p. 580; Migne, *Patrolog. Graec.*, 92, col. 798).

<sup>41</sup> By failing to take into account the probability that the long cross solidi of Pulcheria, Theodosius, Eudocia, Honorius and Galla Placidia struck at Constantinople might have taken their beginning from different years, Voirol (op. cit., p. 440, n. 1) found himself forced to suppose that the coins provide evidence that Galla Placidia had the title Augusta as early as 420 instead of from about February 8, 421, when her husband Constantius became co-ruler with Honorius. The bestowal of the title on Placidia by the two emperors is attested by the contemporary historian Olympiodorus (Müller, *Frag. Hist. Graec.* IV, p. 65, frag. 34). The same writer tells us (p. 68, frag. 46) that Placidia assumed the title anew (ἐπαναλαμβάνει . . . τὸ τῆς Αὐγούστης . . . ἄξιωμα) on her departure from Constantinople after the death of Honorius to recover western rule for her son Valentinian from Johannes.

solidi, was conditioned by the Empress' journey down the peninsula on her return from the East with her son Valentinian III to reclaim the western throne for the Theodosians. Long cross solidi were struck in her name at Aquileia, Ravenna and Rome, the early issues without a doubt in that order.<sup>42</sup> For since the Theodosians returned to Ravenna and Rome from the North,<sup>43</sup> the existence of at least one common obverse die for reverse types of Aquileia (AQ) and Rome (RM),<sup>44</sup> taken together with the relative scarcity of Aquileian and Roman solidi in relation to the numerous pieces struck at Ravenna (RV), tells of the transfer of the northernmost mint, once military necessity no longer required a mint in that region, to Rome.<sup>45</sup> The com-

<sup>42</sup> See PLATE X, 95–98. The specimen from the mint of Rome (no. 96) is placed next to the coin from Aquileia (no. 95) in order to show the common obverse die.

<sup>43</sup> The cities where the western Theodosians stopped on the return route were Thessalonica, Salonae, Aquileia, Ravenna, Rome. The usurper Johannes was brought from Ravenna to Aquileia for execution, which took place in May or June of 425. The imperial party was still in Aquileia on August 6th. Valentinian was crowned at Rome October 23rd. See Pauly-Wissowa, *RE* 20<sup>2</sup>, s. v. *Placidia*, cols. 1921–23; 7A, s. v. *Valentinianus* III, cols. 2233–34, and V. A. Sirago, *Galla Placidia e la trasformazione politica dell' Occidente*, Louvain, 1961; cf. L. Ruggini, "Fonti, problemi e studi sull' età di Galla Placidia," *Athenaeum* 40 (1962), pp. 373–91, an analytical bibliography including numismatic works.

<sup>44</sup> Hirsch Sale Cat. 31 (1912), lot 2007 = Hirsch Sale Cat. 18 (1907), lot 1762. Aquileia, same obverse die as Hirsch Sale Cat. 29 (1910), lot 1544. Rome. Also noted by Ulrich-Bansa, *Moneta Mediol.*, p. 230 and J. P. C. Kent, "Gold Coinage of the Later Roman Empire," *Essays in Roman Coinage Presented to Harold Mattingly*, p. 200, n. 5. See also the account of the Chécý Hoard by Lafaurie (J. Gricourt et al, *Trésors monétaires et plaques—boucles de la Gaule romaine*, Paris, 1958, p. 293). The interpretation of the die identity here, based on the photographs in the Hirsch catalogues, appears to be wrong (see n. 42), and the existence of a "cassure" in the obverse die under discussion doubtful.

<sup>45</sup> Cf. Ulrich-Bansa, *Moneta Mediol.*, p. 230 and F. W. de Salis, op. cit., p. 10: "The mint of Aquileia was certainly suppressed after the downfall of John and the recovery of Ravenna, as there are no coins struck there by Valentinian III and his successors." This sentence is indeed a reminder that in Valentinian's reign this once-great Roman town was destroyed by Attila, so that but a meager modern street, the cathedral and campanile, and a tremendous epigraphical "graveyard" mark its site. The memory of its floruit in antiquity has been preserved in modern times not only through these stones but through the periodical, *Aquileia Nostra*, *Bollettino dell'Associazione nazionale per Aquileia*, which first appeared in 1930.

mon die (PLATE X, 95, 96) suggests the transfer of the mint paraphernalia from Aquileia (AQ) to Rome (RM). The predominance of the Ravennate solidi (RV) shows the stability of that mint as a seat of the court, a stability which was to continue.<sup>46</sup> The end of the western long cross issues bearing the vota legend can be determined from the long cross solidi of Honoria, daughter of Galla Placidia, which began conventionally with the reverse legend VOT XX MVLT XXX<sup>47</sup> but which changed to the legend BONO REI PVBLICAE, (PLATE XI 99) the latter being by far the more common.<sup>48</sup> As de Salis points out, Honoria's coins must fall between the date of the accession of her brother Valentinian in 425 and her exile in 434.<sup>49</sup> Since there would seem to be little reason for the extension of the VOT XX MVLT XXX issues of Theodosius II in the East beyond 425, and since Honoria's coinage with the record of these vota in the West is so slight, the substitution of the legend BONO REI PVBLICAE, used by Placidia (de Salis, p. 214; Cohen I, and later by Licinia Eudoxia; Laffranchi, *Rassegna Numismatica* 28, 1931, pp. 253-4) as well as Honoria (PLATE XI, 99), can safely be placed within the quinquennium 425-430, probably in the earlier part of the period.

The long cross solidi which came into being under Theodosius II and were struck with a variety of imperial portraits, then, were spread over a number of years in time, within the period VOT XX MVLT XXX. De Salis gave their period, that is the period of the Constantinopolitan issues, as 420-425. His dating, appearing in an

<sup>46</sup> One gets a similar picture from the coins of Valentinian III except that his northernmost mint was Mediolanum, not Aquileia. Mediolanum seems, however, to have issued coinage only late in the reign. Ravenna was the first mint from which Valentinian's most common solidi were issued, with a type fundamentally western, though modified (see pp. 66-67; 78-80; 86). The same type was issued at Mediolanum and Rome, in lesser quantity. But it was from Rome that Valentinian's vota solidi were issued, and these pieces show the influence of the western court very clearly. They would seem to indicate, too, that Valentinian wished to honor the old Capital above Ravenna on the special occasion of the imperial vows. Cf. n. 7, on Honorius' vicennalia in Rome.

<sup>47</sup> De Salis, p. 211 and pl. VIII, 12 (cf. Cohen, 4).

<sup>48</sup> Specimens can be seen in the following catalogues: Rollin and Feuarent Sale Cat. May 27, 1889, lot 622; Strozzi (Rome, 1907), lot 2004; Jameson II, 409; Naville Sale Cat. 3 (1922), lot 256; Ratto Sale Cat. (Feb. 8, 1928), lot 4988, from same dies as Santamaria Sale Cat. (Jan. 24, 1938), lot 1083.

<sup>49</sup> De Salis, p. 211; cf. p. 214.



article written shortly after our Civil War, seems to me more flexible and more understanding than the precise dating recently proposed.<sup>50</sup> The dating proposed by de Salis was due at least in part to the fact that he was primarily interested in the Italian coinage modelled on the eastern originals. He was able to draw his conclusions from the long cross coinage of the whole Empire. The Italian coinage which gave his article its title drew its origin numismatically from the mint of Constantinople but historically from the return of Galla Placidia with her young son, soon to be Valentinian III, from the eastern court to Italy. If the existence of the Italian coinage of Galla Placidia did not in itself suggest the spread of the long cross issues over a period of time, the fact that a long cross solidus with VOT XX MVLX XXX was struck for her daughter Honoria would be certain evidence of a spread in time.

Although Theodosius' successor Marcian issued long cross solidi in the name of Valentinian (PLATE XI, 101), Valentinian III did not himself employ the long cross type as we know it from the coinage struck under Theodosius II in the East and Galla Placidia in the West. He seems rather to have modified a long cross version (with P on top of cross) introduced by Honorius. For Valentinian's common, regular solidus is certainly a development from the issue of Honorius where the *labarum* is replaced by long cross with P, the captive by a beast (see pp. 78-80; 86 and PLATES XIV, 139, Honorius; XIV, 142, XV, 143-145, Valentinian), though Valentinian removed the P from the cross, and the immediate model was probably an accession solidus of similar type showing Valentinian with Theodosius II (Ulrich-Bansa, *Moneta Mediol.* p. 229 and pl. I, g). From Valentinian's first successor, Petronius Maximus, to Severus III (Libius Severus) this form persisted (PLATE XV, 146-150), except for the type of Avitus, who returned to Emperor standing on barbarian while holding a *labarum* (Rome) or cross (Arles). Then came eastern domination of the type, for Anthemius (A.D. 467-472) shared his reverse with the eastern Emperor Leo I, holding the long cross in partnership with him, while Euphemia, wife of Anthemius and daughter of the late eastern Emperor Marcian, who had continued the Theodosian long cross coinage in the East

<sup>50</sup> Voirol, A.D. 420 (see above n. 41) and Breckenridge, A.D. 423 (see above, n. 36).

(PLATES X, 93; XI, 100, 102), returned to the long cross coinage, perhaps with the precedent of Placidia in mind, but using her father's legend as Placidia had used her nephew's. The next Emperor, Anicius Olybrius, whose reign lasted only several months and whose coinage is of extreme rarity, struck an original type, a cross encircled by the legend SALVS MVNDI (Cohen, 1 and 3; Ulrich-Bansa, pl. N, a; Carson, *Coins of the World*, pl. 25, 388). After a brief return to the old type of Valentinian III under Glycerius, whose Emperor on the reverse of his coins seems, however, to have stood on nothing but a kind of rectangular framework (but cf. Lafaurie, "Trésor Chécy," p. 282), Julius Nepos and Romulus Augustus (PLATE XV, 151, 152) again struck the long cross type of Theodosius and Placidia, as it was struck by Marcian with the legend VICTORIA AVGGG, bringing the western Empire to its traditional end with a type that had come into being at Constantinople, the New Rome. Thereafter Italy's barbarian rulers continued to strike it—in the name of the eastern Emperor.

From this brief survey of the last imperial solidi before the "fall" of the West it can be seen that the production of long cross coinage at imperial mints was not a continuous process from its inception to its end. For in the West, having served its purpose of heralding the return of the Theodosian dynasty to Rome, the long cross-Victory coinage gave way to a new type close to western tradition from early in the reign of Valentinian III (Emperor standing on monster and holding a different kind of long cross, based on the western *labarum* tradition and the X-P cross of Honorius but lacking the crowning P). Only after several reigns and forty years was the long cross coinage reintroduced in the West by western rulers appointed from the East: Anthemius and especially his Empress Euphemia, daughter of Marcian, the *restitutor* of the long cross coinage in the East. In the West the long cross coinage was briefly in abeyance again under two reigns (Olybrius and Glycerius) until returned to use by the last two western emperors. In the East itself the long cross coinage was not in continuous use to its ultimate end under Zeno. For in the very reign of its inauguration (Theodosius II) it was dropped for at least twenty years to the end of the reign (from sometime between the years A.D. 423 and 430) and reintroduced only under Marcian and Pulcheria (450). In every case where the long cross coinage appeared on western

5\*

imperial solidi, eastern influence was responsible, revealing the dependence, before it actually succumbed, of the western throne on its eastern rival. The nature of the West's decline is therefore reflected in this coinage.

Indication of the exact periods of the production of "imitations" of the long cross coinage by barbarian kings is beyond the matter and competence of this paper. A comprehensive survey of this coinage, "Le monnayage et la circulation monétaire dans les royaumes barbares en Occident (V<sup>e</sup>-VIII<sup>e</sup> siècle)," was published by P. LeGentilhomme in *RN* 1943-45. Involved in this subject is the separation, where possible, of imperial from "barbaric" coinage. For until the national coinages of the "barbaric" kingdoms assumed a character of their own, solidi (and even trientes or reduced solidi, see PLATE XI, 110) with the long cross as the reverse type were struck in the West by these peoples (PLATE XI, 103-109). Thus there was a numismatic bond still joining an Empire already split into East and West, which was at the same time a bond between the various geographical entities into which the West was falling as it broke up into "nations."

In the East Theodosius' long cross type had been revived under Marcian (PLATES X, 93; XI, 100-102) but with a legend new to the type: VICTORIA AVGGG. This legend, unlike the vota legend used by Theodosius with his long cross type, transcended a particular period and was timeless, as the vota legend was not, and could therefore endure from one reign to another as it now did. An interesting consequence of the change is that we have types of Pulcheria with both VOT XX MVLX XXX and VICTORIA AVGGG, the former on solidi struck under Theodosius (PLATE X, 91, 92), the latter on solidi struck under Marcian (PLATE X, 93). Continuing without interruption in the East, the type was ultimately transformed from Victory holding cross to Angel with cross.<sup>51</sup>

<sup>51</sup> A. M. Friend in A. A. Vasiliev, *Justin the First* (Cambridge, Mass., 1950), pp. 421 f.; cf. Voirol, op. cit., p. 434, who dates the angel from the first long cross coinage (A.D. 420 for him); I have not seen his "Die Wandlung der griechischen Siegesgöttin zum christlichen Engel nach antiken Münzbildern," *Jahresber. der Gesellsch. pro Vindonissa*, 1944. P. LeGentilhomme, op. cit. (p. 25 of extr. from *RN* 1943) expressed the same view, and it has appeared in *NNM* 149, p. 63; cf. Cabrol, *Dict. d'arch. chrét.*, I, 2, col. 2104. The tale of Socrates, *Hist. Eccles.* 7, 18, that divine messengers announced the coming Theodosian victory to some travelers may lend support to the theory.

When the total area of dissemination of the long cross coinage, in the West as well as in the East, is taken into account, the significance of the return trip of Galla Placidia to the West will be seen as of great interest numismatically as well as historically. For, of such vitality was the original long cross type which Galla Placidia brought to the West from Constantinople, that when the Victory was transformed into the facing Angel by the Byzantine Emperors beginning with Justin I (see n. 51), some contemporary and later issues in the West retained the original form of the type. It is true that the type disappeared from western imperial coinage until, after some forty years, a Roman empress revived it on the current eastern model. If Galla Placidia did nothing more, however, she set a precedent in bringing the long cross and making it familiar to the West. And just as her building in Italy brought physical adornment and the influence of Byzantine art to the Christian West, so the coin-type Placidia brought to the West spread the Byzantine Christian symbolism through the coinage, no slight medium of propaganda to circulate among the new streams of humanity engulfing the ancient Rome. If the cross on the Theodosian solidi was indeed the cross presented to Jerusalem by the Emperor (through Pulcheria) in the twentieth year of his reign, as a combination of literary and numismatic evidence would seem to indicate (see p. 60 and n. 34), and if Eudocia adorned Jerusalem, as she did, with monuments of Christianity, the Eastern court had no mean ambassadress to the West in Galla Placidia, who carried the long cross coinage from Constantinople to Italy and thus caused the long cross type to be spread in times and places not anticipated by her and still to be identified with certainty by us (for examples of the later long cross solidi in the West see PLATES XI and XV). The introduction of the long cross type to the West was a symbol of that domination of the West by the East which the glory of the old Rome could not now prevent.

#### THE END OF THE VOTA COINAGE

The next vota solidi of Theodosius II carry the legend VOT XXX MVLTT XXXX and show a further development in the use of the cross on the coinage. The reverse type has an enthroned Constantinopolis who no longer holds a victory but a *globus cruciger* (PLATE XII, III—

Theodosius II; 112—Valentinian III).<sup>52</sup> Bearing the same vota numbers but not necessarily of identical date is a very rare consular type of Theodosius II, the reverse of which Theodosius shares with young Valentinian III (PLATE XII, 114).

111. *Obv.*: Usual facing helmeted bust of Emperor, short spear in r. and held behind shoulder, shield on l. DN THEODO SIVSPFAVG

*Rev.*: Constantinopolis helmeted, enthroned l., l. foot on prow, *globus cruciger* in r., long spear in l. Shield rests against throne. Around rim, VOT XXX MVLT XXXX and officina letter. In ex., CONOB Officina letters of specimens at ANS, A, I, S (Newell); I (Gautier).

PLATE XII, 111; struck for Valentinian III, PLATE XII, 112.

114. *Obv.*: Bust of bearded Emperor l., diademed and in consular robe, mappa in r., long cross as sceptre in l. Around rim, DN THEODO SIVSPFAVG

*Rev.*: Theodosius and Valentinian III seated facing, each holding mappa in r., long cross in l. Above their heads, which are nimbate, star. Around rim, VOT XXX MVLT XXXX In ex., CONOB

PLATE XII, 114 (from cast in the British Museum). See also *Numismatica* VII, 1942, p. 42.

We may observe at once that these solidi advertising VOT XXX MVLT XXXX of Theodosius II can be compared to similar vota solidi of Honorius (PLATE IX, 84, 85) because in each case we have 1) a city goddess- (or goddesses-) reverse and 2) a consular reverse, 1 being common and 2 being rare. It seems an obvious inference that the solidi with the city goddess/goddesses were issued over a period of time, in the beginning at any rate, in anticipation of the actual fulfillment of the vows, and that the rarer, clearly consular pieces

<sup>52</sup> The greater number of these pieces seem to bear COMOB rather than CONOB in the exergue. It has been thought that the coins with COMOB were struck in Constantinople for circulation in the West (see A. A. Boyce, "Eudoxia, Eudocia, Eudoxia," in *ANSMN* 6 (1954), p. 139, and n. 23. Recently J. P. C. Kent, "Gold Coinage in the Later Roman Empire," *Essays in Roman Coinage Presented to Harold Mattingly*, Oxford, 1956, p. 203, has suggested that they were struck in various cities of Asia Minor in connection with Theodosius' *expeditio Asiana*.

were issued for the actual occasion of the fulfillment of the vows in conjunction with entrance by the Emperor on a new consulship.<sup>53</sup>

A list of the dates of vow-fulfillment of Theodosius as taken from the chronographer Marcellinus Comes (*Chron. Min.* II, pp. 68–81) provides important non-numismatic evidence that caution is called for in any attempt to date coins from the vota numbers on them. According to the dates given by Marcellinus, Theodosius celebrated the vota in the following years:

quinquennalia	A.D. 406	
decennalia	A.D. 411	
quindecennalia	A.D. 415	a year early
vicennalia	not given	due in A.D. 421
tricennalia	A.D. 430	a year early
XXXX	A.D. 439	two years early
XXXXV	A.D. 444	two years early

If this list is accurate it is clear that the Emperor exercised considerable freedom in choosing the year of celebration, for the intervals between the various five-year vows are either four or five years, between the ten-year vows, nine or ten years, and the festal years are earlier in most cases than one would expect. The vota coinage obviously was not issued in accordance with a rigid and regular plan.

The vota solidi of Theodosius described immediately above record VOT XXX MVL T XXXX, and are, as we have said, of two types; a common one with Constantinopolis seated and holding a globe surmounted by a long cross (PLATE XII, 111, 112) and a rare type which shows Theodosius and Valentinian III seated together on a throne (PLATE XII, 114). The first has the conventional facing head of the emperor, the second has an unusual obverse, the consular type which had been struck for the vicennalian vows (see p. 61 and PLATE XII, 113):<sup>54</sup> a diademed profile head of the emperor holding mappa in r., long cross in l.—a partial representation of his similar figure on the

<sup>53</sup> Cf. discussion pp. 54–58 where the city goddess type (no. 84) is dated before the consular type (no. 85).

<sup>54</sup> Cf. solidi of Honorius, Ulrich-Bansa, *Monet. Mediol.*, pl. IX, 85, who holds eagle-tipped sceptre and mappa.

reverse where both he (taller) and Valentinian (shorter, and with higher footstool for his shorter legs) are seated, each holding a mappa in r., long cross in l. The mappa and the ceremonial robes indicate a consular type. Theodosius and Valentinian were consuls in 425 (Valentinian as Caesar), in 426 (Valentinian now Augustus), in 430—so far for our purpose. In 426 Theodosius held the consulship for the twelfth time, Valentinian for the second. In 430 they held respectively their thirteenth and third consulships.<sup>55</sup> This was the year in which Theodosius actually celebrated his tricennalia, according to Marcellinus Comes. The combination, then, of consular obverse and reverse with the tricennalian legend VOT XXX MVLT XXXX appears to make it certain that no. 114 was struck in 430 or at the end of 429 in honor of the new consulships and the tricennalian festival. Nos. 111 and 112, on the other hand, being unrelated to a consular festival, could well have been anticipatory for both sets of vows and may therefore have had their beginning well before 430. The scarcity of no. 114 and the frequency of nos. 111 and 112 would support this interpretation of the issues. Nos. 111 and 112 belong to a regular issue covering a considerable period of time; no. 114 was occasional, that is, festal, struck for the actual celebrations connected with the tricennalia and the new consulships.<sup>56</sup>

The solidi just discussed seem to be the last of Theodosius II to register the vota, though their reverse type was held over. When the identical type of Constantinopolis was used again, a different kind of dating appeared: IMP XXXXII COS XVII (PLATE XII, 115—Theodosius' daughter Eudoxia; PLATE XII, 116, 117—Theodosius).<sup>57</sup> Here we have the revival of two old methods of dating, by imperatorial acclamation and by consulship. Theodosius' seventeenth consulship lasted from the beginning of 439 to the end of 443. In 444 he became

<sup>55</sup> See the consular lists in Mommsen, *Chronica Minora*.

<sup>56</sup> Cf. this difference in vota issues of seemingly identical date (a difference demonstrable because of the greater rarity of no. 114 compared with nos. 111, 112) with other similar sets of vota issues, such as those of Honorius (pp. 51–60 and PLATE IX, 84, 85).

<sup>57</sup> L. Laffranchi, "Il medaglione aureo di Teodosio II," *Numismatica* VII, 1942, p. 43, gives two reverse types for this legend: 1) seated Constantinopolis; 2) Theodosius seated as consul and on obv. diademed, bearded profile bust, mappa in r. hand, cross in l.

consul for the eighteenth time. Voirol, ignoring the first element of the inscription, ascribed these solidi without hesitation to 439.<sup>58</sup> Laffranchi rightly dated them in 443.<sup>59</sup> The answer to the question of the date depends on IMP XXXXII. What does it mean? In the past the imperatorial acclamation had been conferred when victory demanded and was not something that occurred at regular chronological intervals, certainly not annually; though some emperors, like Domitian, give the impression of having wished to take the title IMP (erator), as well as the consulship, with the regularity of the *tribunica potestas*, which was annual. After the middle of the third century, however, the imperatorial acclamation seems in fact to have become annual, and since it is impossible to interpret the title IMP here in any sense but annual, the coins must be dated to 443, the forty-second year of Theodosius' reign and the last year of his seventeenth consulship, for COS XVIII began in 444. There is then no internal contradiction in the legend IMP XXXXII COS XVII. The only troublesome item is the question concerning the use of IMP XXXXII,<sup>60</sup> the interpretation of which is simple enough, and it is difficult to see how one can do otherwise than date the coins to 443. This makes any connection with the publication of the Theodosian Code, in honor of which Voirol (p. 436) thought the coins might have been struck, unlikely. The only reasonable date for the coins, 443, was five years after the last year of the publication of the Codex. The new method of dating appears to have been repeated, as the reporting of rare solidi with IMP XXXXIII COS XVIII suggests (PLATE XII, 118).<sup>61</sup>

These solidi with the imperatorial number have been considered here only because they show that one of the last types appearing on Theodosius' vota solidi (Constantinopolis with *globus cruciger*) was carried forward under a new legend, a legend which was nevertheless

<sup>58</sup> "Münzdokumente," p. 436.

<sup>59</sup> Op. cit., p. 42. Cf. A. A. Boyce, "Eudoxia, Eudocia, Eudoxia," *ANSMN* 6 (1954), pp. 134-38 and Kent, "Gold Coinage," p. 203.

<sup>60</sup> Cf. Ulrich-Bansa, *Numismatica*, 1935, p. 25: *Molte questioni di carattere storico e numismatico sono connesse con l'interpretazione della leggenda-data di questo rovescio, ma al momento attuale non ci si sente in grado di affrontare il problema di offrirne una spiegazione convincente.*

<sup>61</sup> A drawing in *Numismatiché Listy*, 1947, p. 65, reproduced also in Boyce, op. cit., pl. XV, no. 8. Mr. J. P. C. Kent informs me that a solidus with this legend was recently sold in Vienna.



a date. This legend, itself presenting a problem of unorthodox usage in dating, serves as a warning against rigid interpretation of dates and title numbers on coins, including vota indications.

The type of the original solidus on which this study is based (X MVLT XX, PLATE IX, 75) follows a pattern that came into being in the time of Theodosius I when vota dates began to be represented on a shield held by one of the two imperial city goddesses, instead of by both Roma and Constantinopolis, as previously. The type with the single goddess was an admission that the empire was divided between separate rulers in East and West. The very next vota solidi of Theodosius II VOT XV MVLT XX (PLATE IX, 77) show a return to two goddesses and reflect a brief reunion in spirit at least of eastern and western empires under Honorius and his young nephew Theodosius II. But when the two goddesses reappear in the West on one of Honorius' VOT XXX MVLT XXXX issues (PLATE IX, 84), the coins have the appearance of suggesting not union through cooperation but of propaganda of a West ready to take up arms against the East in order to press its claim to authority in matters of the succession throughout the empire. So far had history moved in a decade. The question of the succession was always a touchy point with the heirs of Theodosius I, and the problem imminent after the death of Constantius III, the status of his son Valentinian, was to be solved ironically by the flight of the western heirs, Placidia with Valentinian, to the eastern court until the West could be reclaimed by them after the death of Honorius and the defeat of Johannes, who had been chosen by the Senate to fill the gap in the succession. The two goddesses at the end of the reign of Honorius were symbols of empire without a reality to symbolize, even of the spirit; and though Valentinian returned under the patronage of Theodosius, in the latter part of Theodosius' reign the single goddess (Constantinopolis with *globus cruciger*) remained to sit alone. Hereafter she seems to have disappeared.<sup>62</sup>

With the reign of Theodosius II and the reign of his cousin and son-in-law Valentinian III, who was assassinated less than five years after the death of Theodosius, the true vota coinage comes to an end.

<sup>62</sup> Except for a possible return on coins of Justin II (*BMCByz.* I, p. 75, ci. p. 77). Toynbee, op. cit., p. 277.

Those solidi of Pulcheria which bear vota numbers, having identical reverse types and vota numbers as the solidi of Theodosius (PLATE X, 91, 92), are of course to be given to her brother's reign, not to that of her husband Marcian, the successor of Theodosius. Likewise, one of the solidi struck in the name of Valentinian III and bearing vota numbers belongs to a series issued for the vota of Theodosius. The following solidi with vota numbers were struck in the name of Valentinian III:

<i>Vota</i>	<i>Mint</i>	<i>Rev. Type</i>	<i>Obv. Type</i>
PLATE XII, 119. VOT XXX MVLTT XXXX (of Theod. II)	Constantinople	Constantinopolis seated, holding <i>globus cruciger</i> , as on coins of Theod. II.	Regular eastern facing head type.
PLATE XII, 120, 121. VOT X MVLTT XX (of Val. III)	Ravenna (120) Rome (121)	Emperor in consular robe, seated, holding mappa and <i>globus cruciger</i> .	Profile bust of Emperor holding mappa and sceptre terminating in cross.
PLATE XII, 122. (With the above cf. a semissis in the Newell Coll. with the same vows.)			
PLATE XII, 123. VOT XXX MVLTT XXXX (of Val. III)	Rome	Emperor holding long cross in r., Victory crowning him on l., and resting foot on human-headed serpent.	Facing helmeted head of Emperor holding spear in front and shield bearing christogram as on solidi of Honorius struck at Ravenna. Cf pp. 51; 54-59
PLATE XIII, 124. VOT XXX MVLTT XXXX (of Val. III)	Rome	Emperor standing facing, sceptre terminating in cross in l. With r. he raises kneeling figure.	Profile bust of Emperor holding mappa and sceptre terminating in cross.

No. 119 is placed first because its type, its style and vota numbers show clearly that it belongs to the eastern coinage struck for the tricennial year of Theodosius II, A.D. 430 (see p. 70). As no 112 (PLATE XII) it is placed with the group of which it is a part, the tricennial coinage of Theodosius II.

Nos. 120 and 121 celebrating Valentinian's decennalia must be dated to January, 435 if we are to regard them as celebrating jointly the decennalia and Valentinian's entrance upon his fourth consulship, as the consular obverse and reverse suggest. This places the coinage within the true decennial year, Oct. 434–Oct. 435, and at the same time respects the consular types. The western (Valentinian) types are copied from the neat eastern types of Theodosius II struck for his tricennalia in 430 (PLATE XII, 114). The same consular obverse had already appeared on solidi of Theodosius struck for his vicennalia (Carson, *NC*, 1959, pp. 15f., and pl. III, 17; PLATE XII, 113). On similar consular obverses of Mediolanum, Honorius had carried eagle-tipped sceptre (Ulrich-Bansa, pl. IX, 85) or laurel sprig (*ibid.*, pl. IX, 87) not sceptre terminating in cross.

No. 122 (PLATE XIII) is a semissis in the Newell Collection celebrating the same vows as nos. 120 and 121, but no. 122 is not consular.

No. 123 (PLATE XIII) evidently bears the same relation to no. 124 (PLATE XIII) as no. 84 (PLATE IX–Honorius) bears to no. 85 (PLATE IX–Honorius); it represents a general vota issue VOT XXX MVLT XXXX while no. 124 represents the actual festal, consular, and tricennial solidi. Because of its closeness to no. 84 of Honorius in respect to obverse type, I was once inclined to place it earlier and regard it as a western issue of Valentinian III for the tricennalia of Theodosius II and therefore contemporary with PLATE XII, 119. But several considerations have led me to place the coin with no. 124 (PLATE XIII) in celebration of Valentinian's own tricennalia.<sup>63</sup> Those considerations are as follows: *Historical or general*. The earlier use by Constantius II and Honorius of Chi Rho on the Emperor's shield of their tricennial solidi (see p. 58); as Honorius copied Constantius,

<sup>63</sup> My feeling and historical arguments vs. an early dating were confirmed in London (Spring, 1960) by J. P. C. Kent who argued for a late date on stylistic criteria not discussed here.

except for placing his spear in front rather than behind, so Valentinian copied Honorius for his own, not Theodosius' tricennalia. *Stylistic or objective.* 1. Objective criteria that could be used in determining whether no. 123 (PLATE XIII) was closer in date to PLATE XII, 120, 121 or to PLATE XIII, 124 were, in my opinion, epigraphical, i.e., the Emperor's name, the mint mark RM, the exergual signature COMOB. Of these only COMOB seemed to provide help; whereas frequently this group of letters on western coins follows a design in which C, M, and B are larger than the two O's (CoMoB) as on no. 121; on no. 123, as on no. 124 the letters are of relatively even height (COMOB). 2. Another objective criterion appeared to be the segmented border. The segments of the border on coins of the Roman mint seemed to become thicker and more pronounced late in Valentinian's reign. Comparison of the earlier SALVS REI PVBLICAE solidi (Empress enthroned: Laffranchi, *Rassegna Numismatica* 28, 1931, pp. 254-5; Cohen, 1) of his wife Eudoxia with her later coins (VOT XXX MVLT XXXX, companions to no. 124 of Valentinian) bears this out, the borders of the later group having more pronounced segments. No. 123 has these larger and more pronounced segments and the coin therefore appears to belong close to no. 124 rather than to the early part of the reign, 430, the date of Theodosius' tricennalia or 435, Valentinian's decennalia.

No. 124 (PLATE XIII) we place last as representing the actual festal issue for the tricennalia of Valentinian III. The celebration was due in October 454 but was probably deferred until Valentinian became consul for the last time in January 455. The obverse is the obverse of nos. 120 and 121. The reverse is an innovation, combining an old motif ("restitutor," see pp. 82-84) in new dress and the tricennalian vows of Valentinian.

All three types of nos. 120, 121 and 124, one obverse and two reverses, show the Emperor in the capacity of what we might call the Christian Consular as introduced by Theodosius II (PLATE XII, 113, 114). For the distinguishing element of these types is the long cross borne by the Emperor (and on no. 119 by Constantinopolis), the same form of the cross which had appeared on our "long cross" coinage of Theodosius II, though on most of the coins under present discussion the symbol is small (but of the same proportions) com-

pared with the long cross that matched in size the Victory who held it on the "long cross" solidi. In contrast to these consular types, nos. 119 and 123 may be said to have reverse types which are so general that in spite of the vota date they could have been struck over a period of time, whereas 120, 121 and 124 appear to have reference to something particular, reference to a point in time. No. 119 is pure "eastern," part of a series of Theodosius II. Nos. 120, 121 and the obverse of no. 124 stem clearly from the sojourn of Valentinian III at the court of Theodosius II before his return to Italy, and from the influence of that court on the young boy newly made Emperor in the West with the backing of the East. Except for the fact that the long cross does not terminate in the christogram, the types of no. 123, on the other hand, are traditionally bound to the West and to coinage struck at western mints. The fact that its reverse type is identical with Valentinian's regular reverses, while its obverse imitates an obverse of Honorius (PLATE IX, 84) points up the manner in which Valentinian's coinage developed from a number of western elements, as well as from influences of the East. This development can be seen in coinage of Valentinian which is not concerned with the vota—his regular solidi with the same reverse type but bearing instead of the vota number the legend VICTORIA AVGGG. To these we shall return in a moment. The young Emperor's earliest western pieces were solidi struck (PLATE XIV, 141) in the same design as the solidi of Johannes (PLATE XIV, 140), who served as Augustus after the death of Honorius until his defeat by the Theodosians returning from the East. Johannes had invented no type of his own but had made use of Honorius' common pagan type (PLATE XIV, 137, 138), not Honorius's new Christian type (PLATE XIV, 139). Valentinian, very soon abandoning the old Honorius-Johannes pagan type (it is very rare for him) based his common reverse type upon this new type of Honorius, where the Emperor was represented holding a long cross terminating in a P (therefore a christogram) and trampling upon a lion with a serpent's tail rather than upon a human enemy. This type of Valentinian was a development from the new Christian reverse of Honorius which may represent that Emperor's last regular (i.e., not festal) solidi. The new reverse of Valentinian showed the Emperor holding the long cross, but without the terminal christo-

gram, and the enemy upon which Valentinian trod was conspicuously a serpent with a facing head that seems now human, now beast (PLATE XIV, 142ff.). Perhaps as a concession to the now swiftly dying paganism the Emperor bore on his left hand the Victory which had shared Honorius' pagan type but which had been abandoned for a short sword on the Emperor's new Christian type. All of these reverses shared the traditional legend VICTORIA AVGGG.

Valentinian's new reverse type evidently did not travel down the Italian peninsula with him on his return from the court of Constantinople as the long cross coinage travelled southward with Galla Placidia from Aquileia through Ravenna to Rome. Since Valentinian's new solidi were not struck at Aquileia as were Galla Placidia's long cross solidi, Valentinian's new reverse type must have been designed and struck first at Ravenna or Rome after his coronation in October 425.<sup>64</sup> It seems clear from a solidus struck at Rome for the coronation (Ulrich-Bansa, *Moneta Mediolanensis*, p. 229 and pl. I, g) that the figure of the young Emperor which was to be his standard representation on the reverse of his solidi was introduced to the Empire at the coronation in Rome. On the reverse of this piece Valentinian is shown with Theodosius II. His figure is different from the figure on the regular solidi in four respects: 1) he is crowned by the hand of God; 2) there is (therefore) no Victory crowning him on the globe he holds; 3) his long cross (or long sceptre terminating in cross) rather than his foot rests upon the monster; 4) the serpent part of the monster appears at the left instead of the right. The occasion for the first use of this manner of representing the Emperor would then appear to have been the Coronation; the mint, Rome. An example of a Roman die re-cut for use at Ravenna has been recorded for the issue of the regular solidi with this figure of Valentinian.<sup>65</sup> This, too, suggests the introduction of the type from the mint of Rome. It is known to have been struck at a third mint, Mediolanum (PLATE XV, 145) but toward the end of the reign (Ulrich-Bansa, *Moneta Mediolanensis*, p. 226), probably in connection with tribute exacted by Attila for leaving Italy.

<sup>64</sup> For the date, Pauly-Wissowa, *RE* VIIA (1948), s. v. *Valentinianus* III, col. 2234.

<sup>65</sup> J. P. C. Kent, "Gold Coinage, etc.," *Essays Presented to Harold Mattingly*, Oxford, 1956, p. 200, n. 5.

The reverse of no. 123 (PLATE XIII), then, appears to have been derived immediately from the mint of Rome, ultimately from earlier types of the mint of Ravenna. While based on Valentinian's coronation solidus it is in reality a modification of the reverse of Honorius' Christian Emperor issue (PLATE XIV, 139). This reverse of Honorius was itself a modification of earlier standing emperor types struck by Honorius and his predecessors. Voirol in three pictures but with no comment,<sup>66</sup> illustrated the evolution of the standing Emperor types from a purely pagan figure (see PLATE XIV, 137, 138) through Honorius' Christian Emperor (see PLATE XIV, 139), to a third figure introduced by Valentinian and showing a combined effect of pagan and Christian symbolism (see PLATE XIV, 142). We have tried to show in detail the development here from traditional and pagan to new Christian type. John's regression to the pagan type may have been tendentious (cf. Voirol, p. 443): he curbed the privileges of the clergy which Theodosius and Valentinian promptly restored (see e.g., *Cod. Theod.* 16, 2, 47; 16, 5, 62). Valentinian's brief use of the same pagan type shows that he or the mint of Ravenna was simply following tradition, or possibly using a die of Johannes, until his new type was designed and struck.

We have discussed the reverse of no. 123 at length. Its obverse with facing helmeted head and christogram on shield is identical, except for the emperor's name, with the obverse of Honorius' Ravennate solidi discussed on pp. 54-58 (PLATE IX, 84), also struck for a tricennialian period. The influence of Ravenna is clear. Since the solidus has no festal character, apart from its vota legend, it was probably struck over a period of time before or during Valentinian's tricennialian festival, not for the festival itself.

It is otherwise with nos. 120, 121 (PLATE XII), whose types define them more explicitly. Their types are consular. They must therefore be close to the entrance upon a new consulship for the Emperors at a time coinciding with celebration of the fulfillment of the vows.

The consular nature of nos. 120, 121 and 124 suggests a combined celebration of vows and entrance upon a new consulship. The particular obverse type, identical for both reverses, is derived from rare solidi struck by Theodosius II in Constantinople for his own vota,

<sup>66</sup> "Münzdokumente," pl. II, 25-7.

XX MVLТ XXX and XXX MVLТ XXXX (PLATE XII, 113, 114)<sup>67</sup> and so shows the continuing influence of the East on western coinage. Valentinian, from the time of his third consulship in 430 entered upon a new consulship every five years; in other words from COS III through COS VIII in the year of his death (455) his entrance upon a new consulship coincided with his completion of a vota period.<sup>68</sup> There is no evidence from solidi, so far as I know, that he ever celebrated a quinquennium, since only ten-year vota are mentioned, but nos. 120, 121 and 124 can hardly have other indications than the actual celebration of decennial and tricennial vows and the anticipation of vicennial and forty-year vows, combined with entrance upon a new consulship. VOT X MVLТ XX can refer to none other than Valentinian, for Theodosius' decennalia were long past, and he had celebrated his own tricennial vows in 430 on coins with similar obverse, following the precedent of his vicennialian festal issue (PLATE XII, 113, 114).<sup>69</sup> Nos. 120 and 121 refer to Valentinian's decennial vows due for fulfillment in 435. As for no. 124, any initial impulse to see here once more the vows of Theodosius (Ulrich-Bansa, *Moneta Mediolanensis*, p. 231) is dispatched by the existence of rare solidi of Valentinian's wife, Licinia Eudoxia (PLATE XIII, 125),<sup>70</sup> which record the same vows VOT XXX MVLТ XXXX and are in spirit so like no. 124 that there can be little doubt that the coins of the Emperor and Empress are to be paired off as actually struck to celebrate Valentinian's tricennalia, presumably between October 454, the beginning of the thirtieth year of the reign, and March 455, the date of Valentinian's death. Licinia Eudoxia was made Augusta at Ravenna on August 6, 439<sup>71</sup> and therefore can hardly have had any coinage of her own before that year.<sup>72</sup> Consequently the possibility

<sup>67</sup> See pp. 60-61; 70-71.

<sup>68</sup> Consular lists in Mommsen, *Chron. Min.*

<sup>69</sup> Laffranchi, *Numismatica* VII (1942), p. 42; see also p. 70 above. For the vicennialian solidus with consular obverse, *NC*, 1959, pp. 15f. and pl. 3, 17.

<sup>70</sup> Laffranchi, "Nuovo aureo di Licinia Eudossia," *Rassegna Numismatica* 28 (1931), pp. 251-6, no. 9; Ulrich-Bansa, "Note sulle monete dell'Augusta Aelia Licinia Eudoxia," *Numismatica*, 1935, pp. 25-31; Cohen, *Médailles Impériales* 8, pp. 218f., 2.

<sup>71</sup> Pauly-Wissowa, *RE* VII-A (1948), s. v. *Valentinianus* III, col. 2237.

<sup>72</sup> Solidi celebrating the marriage of Valentinian and Eudoxia were struck in the name of Theodosius (Spink's *Numismatic Circular*, 1960, p. 73, fig. 1; 1959, p. 155, fig. 3).



that VOT XXX MVLT XXXX on her coinage refers to the vows of Theodosius II is eliminated, for Theodosius celebrated his tricennalia in 430. Coins of Valentinian III recording VOT XXX MVLT XXXX of Theodosius II are represented by no. 119, not 124, which, along with solidi of Eudoxia, was struck for Valentinian's own tricennalia.

A detailed discussion of the reverse type of the last vota solidi will show the significance of the type in conjunction with the date. The Emperor facing, in full figure and in consular, not military, dress holds the cross in his left hand and with his right holds the hand of a kneeling figure whom he is presumably raising. From our knowledge of earlier coinages we can pronounce this a "Restitutor" type without hesitation.<sup>73</sup> The true "Restitutor" type seems to have been used for the first time on the Roman coinage by Staius Murcus,<sup>74</sup> an officer of Caesar's who was governor in Syria when Brutus and Cassius fled to the East. From the nature of his "Restitutor" type, which evidently never existed in great numbers, one may suppose that the uncertain state of affairs after Caesar's assassination gave Murcus for a short time a kind of regal status in the East. After service with the Liberators, he took his fleet over to Sextus Pompey who subsequently had him killed. Since Murcus struck his coins in the East (*BMCRep.* III, pl. cxii, 10), it is reasonable to suppose the type a result of Hellenistic concepts Murcus acquired in that part of the world. A similar type was struck by Sardes (*BMCLydia*, pp. 250f., 98-101; *Syll. Cop.* 515) out of gratitude to Tiberius. Galba applied it to *Libertas* (*BMCEmp.* I, p. 358, 258) and Vitellius used it on a rare

<sup>73</sup> One can get a notion of the history of these types by running through the legend indexes of the British Museum Catalogues and, for the periods where these are lacking, the indexes of *RIC*. For medallions mentioned in the ensuing discussion, see Gnechi, *I Medaglioni Romani* (Milano, 1912) and J. M. C. Toynbee, *Roman Medallions*, NS 5 (ANS, 1944). See also n. 80 below.

The account of the Restitutor types here was written independently of L. Cesano's account, "Un Medaglione Aureo di Libio Severo e l'Ultima Moneta di Roma," *Studi di Numismatica* I (1940), pp. 87-90.

<sup>74</sup> The so-called "Restitutor" types of the Aquillius family do not seem to me true "Restitutor" types to be compared with the raising of a kneeling figure, which is the type we are concerned with here. On the subject in general see Regling's note in H. Dressel "Ein Tetradrachmon des Arsakiden Mithradates III," *ZfN* 33 (1922), p. 177; P. L. Strack, *Untersuchungen zur römischen Reichsprägung des zweiten Jahrhunderts*, I Stuttgart, 1931, p. 190, especially n. 829; A. Alföldi, *Die Ausgestaltung des monarchischen Zeremoniells*, RM 49 (1934), pp. 52 ff.

issue (H. Mattingly, *JRS* X, 1920, p. 40), after which it appeared under the Flavians on Vespasian's "Roma Resurgens" types (*BMC-Emp.* II, p. 87, 425; p. 121, 565; p. 194, 11 ; p. 202, §). Trajan applied it to Italy, Hadrian to the provinces, giving it a universality which it never lost. This in brief is the earlier history of the type which enjoyed considerable popularity in the trying third century A.D. (see the aureus of Valerian, PLATE XIII, 126 and the "Restitutor Britan" piece of Carausius, *NC* 1953, p. 131). It was also used as a medallion type by the dynasties of Constantine, Valentinian I and Theodosius I as well as by earlier emperors.

Extending Trajan's "Rest(ituta) Italia" concept to particular Roman provinces and to the Empire as a whole (*orbis terrarum*), Hadrian's catholic use of the "Restitutor" idea was probably responsible for its survival into the late Empire.<sup>75</sup> But in the third and fourth centuries A.D., when the Empire was constantly beset with external foes pressing closer to and within the borders, the idea of the imperial "Restitutor" was maintained as hopeful propaganda by such harrassed rulers as Gallienus and Aurelian. That there was much vain wishful thinking bound up in it is shown by Valentinian's use of the idea shortly before his end, the end of the Theodosian House, and the end of the concept of a unified Empire. From the inception of this type of coinage there were different "Restitutor" types and legends, and often a number of different "Restitutor" types shared a common legend such as the *Restitutor Orbis* coinages of the third century. Our particular type is close to earlier types with various legends: *Restitutor Orbis* or *Orientis* in the third century (cf. PLATE XIII, 126, an aureus of Valerian in the Newell Collection), *Restitutor Rei Publicae* in the fourth, and to some types of Constantius Chlorus and Constantinian types with the legend *Pietas August(i) N(ostri)* or *Pietas Augustorum*.<sup>76</sup> Nearest in time seem to be medallions of

<sup>75</sup> For Trajan's "Italia Restituta" and Hadrian's "Restitutor" types see *BMCEmp.* III, Index V, pp. 621 and 628f.

<sup>76</sup> The following is a list of photographs of late "Restitutor" coins and medallions compiled from standard catalogues: Tacitus, Gnechi II, pl. 116,9; Florian, Gnechi II, pl. 118,11; Constantius Chlorus, Toynbee, pl. 8, nos. 5, 6; Constantine I, Gnechi I, pl. 7,9, Maurice I, pl. 9,3; Constantinopolis, Gnechi II, pl. 131, 7; Constantius II, Maurice I, pl. 14,1; Valens, Gnechi I, pl. 15,2; Gratian, Toynbee, pl. 29,9; Valentinian II, Gnechi I, pl. 19,8, Toynbee, pl. 35, 1 and 2; Theodosius I, Gnechi I, pl. 19,12.

Valens and Valentinian II (*Restitutor Rei Publicae*, struck at Trèves) and of Theodosius I and Valentinian II struck at Aquileia. On these the facing Emperor holds the *labarum* with christogram, and here the female figure being raised is turreted, as she was on the *Restitutor Italiae* coins of Trajan and the *Restitutor Orbis Terrarum* types of Hadrian. Our figure does not seem to be turreted. At the back of her head on one specimen there seem to be diadem ends, and on another, a roll of hair (Naville III, 255). Whether we have here *Res Publica*, *Italia* = the West, *Orbis Terrarum*, or possibly the barbarian nations federated within the Empire, this is one of the very few cases where a "Restitutor" type is associated with the vota.<sup>77</sup> What we have here is evidently a combined celebration of the fulfillment of Valentinian's tricennial vows, the saving of Italy from the Huns, possibly the elimination of Aetius from power and from rivalry to the Emperor, and the Emperor's last consulship. That the happy state of affairs celebrated did not last, did not in fact exist, makes little difference.

The tricennalia of Valentinian III are not recorded in literature or on inscriptions so far as I know. Delbrueck (*Spätantike Kaiserporträts*, Berlin, 1933) placed the VOT XXX MVLT XXXX coinage for Valentinian III in A.D. 455 (p. 99), for Eudoxia, ca. 450 (p. 103) and gave 453 as the date for Valentinian's tricennalia. Better coordination of dates is possible. Valentinian's thirtieth year began in the fall of 454 and would have ended in the fall of 455. But his death came in March. In January 455 Valentinian entered upon his last consulship.<sup>78</sup> Since his previous consulship began in 450, and the tricennial year was October 454–October 455, we must place the coins close to January 455 or deny that they were associated with the new consulship as well as the vota. Unless evidence to the contrary is forthcoming, it seems best to retain the traditional association of vota, idea of triumph, and new consulship, and to place the tricennalia in A.D. 454/5, the striking of the coins perhaps at the end of 454, in anticipation of a January celebration of both vota and consulship.

<sup>77</sup> Cf. Gnecci II, p. 112 and pl. 116, 9 (Tacitus): *R. Reipublicae Vota Publica*; and p. 115, pl. 118, 11 (Florian): *R. Saeculi Vot X*.

<sup>78</sup> *Chron. Min.* I, pp. 247, 483.

With this date the type would seem to fit. The Emperor, himself not a warrior, is in festal robes rather than in the military dress which Constantius Chlorus, Constantine, Valens, Theodosius I, and Valentinian II wore on their "restitutor" medallions,<sup>79</sup> and Valentinian bears the cross taken from the eastern coinages rather than the *labarum* with christogram which had been in use on the western coins and medallions. Nor is Valentinian nimbate as were the emperors just mentioned. The type seems to have been new in detail and evidently was not repeated.<sup>80</sup> It can be associated with Valentinian's vota only because in the vota period mentioned (XXX-XXXX) the Emperor conceived of himself as restoring the world (*orbis terrarum*) and the *Res Publica* after the containment of the Huns. This scene depicting a beneficent relation between Emperor and subject is quite different from recent representations of emperors on solidi who, including Valentinian himself, were shown trampling upon the enemy or upon a monster (see PLATES XIV, XV). Previously Valentinian on his regular coinage had trod upon a human-headed serpent (lion-headed according to Hess Cat. Mar. 24, 1959, lots 393,4) doubtless representing the barbarian world (PLATE XIV, 142). His uncle Honorius had trod upon a captive (PLATE XIV, 137, 138) and had been followed in his use of the type during the brief reign of Johannes

<sup>79</sup> See n. 76.

<sup>80</sup> A more complicated type, similar to one of the Constantinian period which included figures of Roma and Victory, appears on a large gold medallion of Libius Severus (A.D. 461-65) published and discussed in detail by S. L. Cesano in "Un medaglione aureo di Libio Severo e l'ultima moneta di Roma imperiale," *Studi di Numismatica* I, fasc. 1 (Rome, 1940), pp. 83-98, an article which concludes with a survey of the coinage (particularly the solidi) from Libius Severus to Romulus Augustus. Signorina Cesano points out (p. 92) that the secular content of this *A* medallion of Libius Severus is in tradition with the content of earlier similar medallions of Christian emperors who struck Christian symbols on their coinage but not on their medallions, which were reserved for traditional pagan festivities of state. Reasoning along these lines we may say that the Christian content of Valentinian's "Restitutor" solidus is in tradition with the development of vota solidi as well as other solidi toward a Christian ideology. What makes Valentinian's solidus exceptional is its combination of the vota-restitutor-Christian ideas, two separate pagan concepts united by an Emperor whose sceptre had become identified with the cross. It may be noted that Ulrich-Bansa, *Monet. Mediol.*, p. 271, n. 40, questioned the genuineness of the *A* medallion of Libius Severus. But cf. J. M. C. Toynbee, *NC* 1940, pp. 17-23.

(PLATE XIV, 140). During his reign, Honorius had also introduced a long cross type of his own replacing the *labarum* with a long cross surmounted by a P and the captive with a "mythical animal" resembling a lion (PLATE XIV, 139). Since he followed immediately upon Johannes, who had used Honorius' traditional "emperor subduing barbarian" type, Valentinian, too, but only at the very beginning of his reign, and at Ravenna, using perhaps a die of Johannes, trod upon the human figure rather than the "mythical animal," (PLATE XIV, 141) (for examples of this rare issue see de Salis, *NC*, 1867, pl. VIII, 10; Glendining Sale Catalogue [May 27 1936], lot 254; see also Delbrueck, *op. cit.*, p. 98, no. 1 = Naville Sale Cat. 3, 253). So slight had been Valentinian's issue of this type when he changed to a variant of Honorius' Christian Emperor type, that it is almost unknown for him, and Valentinian has come to be associated exclusively with the Christian Emperor standing upon a human (or lion-headed) serpent. This type, seeming to look back at the pagan anguiped giants subdued by Zeus and Athena on imperial (Diocletian) and local (Selucia ad Calycadnum) coins and forward to St. George and the Dragon, became Valentinian's regular, common solidus (PLATE XIV, 142).<sup>81</sup> And so the special "Restitutor" type created for his tricennalia and showing a merciful Emperor receiving homage from a grateful subject was a radical departure in spirit from Valentinian's regular solidi. The merciful pagan emperor and the victorious Christian emperor were now transformed into the merciful Christian emperor, a figure that seems unsuited to the slayer of Aetius. Like the rare solidus of his Empress showing the christogram surrounded by a wreath and demonstrating by the legend SALVS ORIENTIS FELICITAS OCCIDENTIS (de Salis, p. 206 and pl. VIII, 1; Sabatier I, s. v. Eudoxia I, pl. IV, 25; cf. E. Demougeot, following Goodacre, in her impressive and useful work, *De l'unité à la division de l'empire romain 395-410*, p. 264) that the concept of a united Empire was not dead, Valentinian's "Resti-

<sup>81</sup> Cf. Maurice I, pl. 9, 2 (*labarum* on serpent; Gnecci I, pl. 10, 9 (Constantius II on horseback; beneath, serpent); Gnecci II, pl. 139, 8 (Julian treading on monster). On these late imperial types see also E. Babelon, "Attila dans la numismatique," *RN* 1914, esp. pp. 308-14; A. Grabar, *L'empereur dans l'art byzantin*, Paris, 1936, pp. 43-5 (human-headed serpent); 160 (removal of brutality from the coinage); J. Babelon, "La thème iconographique de la violence," *Stud. Pres. to D. M. Robinson* II, pp. 278-88.

tutor" solidus is a document representing an unfulfilled hope, for shortly after it was struck the Emperor was dead and chaos had set in anew. For the West had in a short space of time undergone a vast transformation which differentiated it politically from the East more sharply than ever. The very coinage of the time with its degenerate style closely resembling the style of the rare gold pieces that were to follow under Valentinian's successors (cf. PLATE XV) shows how "barbarized" official Rome had become. Although some of the solidi shown on PLATE XV may be "barbaric imitations," it seems certain, as comparison with the latest rare vota solidi suggests, that the regular coinage in the West was being produced by "barbarian" officials and artisans (cf. the views of Ulrich-Bansa, *Monet. Mediol.*, pp. 238f.).

With the reigns of Theodosius II and Valentinian III the recording of the vows on solidi seems to come to an end, and reference to the vota on other metals and denominations is indeed rare. Marcian's long cross coinage, carrying on the type which Theodosius and Placidia had spread over the eastern and the western world, always bore the legend VICTORIA AVGGG, never a vota number, and this inscription persisted as long as the type lasted, until the reign of Anastasius in the East, and longer in the West. Those solidi of Pulcheria which bear vota numbers belong to her brother's coinage, not that of her husband. Rare solidi of Leo I with the seated Constantinopolis and VOT XXX MVL T XXXX (e.g., a specimen in the Statens Historiska Museum which was in a hoard found on the island of Öland, Sweden, and has been called to my attention by Joan Fagerlie of the ANS) are possibly hybrids using a reverse of Theodosius II. In the West, Valentinian III had carried on the tradition of the vota solidi under the influence of both his western predecessor Honorius and his eastern mentor Theodosius. A solidus of Majorian, like his silver, bears the reverse inscription VOTIS MVL TIS,<sup>82</sup> showing that whatever value the vota legends once had for indicating the date of the coinage, that value has disappeared here. This and the growing use of XXXX, the highest vota number used, shows the vows now suggesting an indefinite idea of imperial eternity rather than marked-off periods of the reign. The common use of XXXX is reflected in its

<sup>82</sup> Cohen 12 (Brit. Mus.), *AR*, Cohen 13.

appearance on silver medallions (PLATES XIII, 133, XIV, 134) bearing the name of Justin.<sup>83</sup>

Silver of Julius Nepos (A.D. 474–5) is reputed to bear VOT V MVLT X.<sup>84</sup> On the coinage of the eastern emperors the Victory continues to inscribe the vota on semisses (PLATE XIII, 127–132: Theodosius II—Anastasius), but the numbers recorded seem to have little actual meaning, for the figures are sloppy and imprecise. There are semisses of Marcian reading XV/XX or XV/XXX (a coin in the ANS collection reads clearly cross / XXXV (PLATE XIII, 130),<sup>85</sup> and of Leo I reading XV/XX or XV/XXX;<sup>86</sup> of Leo and Zeno, XVX;<sup>87</sup> of Zeno alone, VXXX or VXXV, both for XXXX?<sup>88</sup> Anastasius, XXX?, XXXX definitely;<sup>89</sup>

<sup>83</sup> Two of these medallions (PLATES XIII, 133; XIV, 134) are in the Newell Collection. Since this paper was written, these medallions, along with a specimen in the Dumbarton Oaks Collection, have been published by A. R. Bellinger (*Dumbarton Oaks Papers* 12 (1958), pp. 152–3). A medallion of this type, found at Dorylaeum, Phrygia, was published by B. Pick as a medallion of Justinian I in “Ein neues Porträt des Kaisers Justinian,” *Num. Zeit.* 60 (1927), pp. 21–6, an article which cites many late, corrupt, and meaningless *vota* legends (pp. 24–6). The legends on the obverses of the two Newell pieces, when studied together, make it clear that the name of the emperor is Justin, not Justinian. But there appears to be some question as to which Justin—I or II—issued the medallions. For in answer to a recent query of mine (1963), Mr. Philip Grierson has stated that he wonders whether these silver medallions should not be attributed to Justin II, together with most of the silver coins assigned to Justin I. “In the case at least of the large medallions,” adds Mr. Grierson, “it is worth noting that solidi of Justin II with a short beard have since been found.” The process by which L of MVLT was corrupted to S on these medallions can perhaps be understood when one sees such examples of L and T as appear on pl. VIII, 79 b of Ulrich-Bansa, *Monet. Mediol.*

<sup>84</sup> Cohen 12 (Tanini).

<sup>85</sup> Sabatier (Marcian, no. 7) cites “XV–XX ou XX–XXX” but the drawing on his plate clearly shows XV–XXX.

<sup>86</sup> Ratto Sale Cat. (Dec. 9, 1930), 254 (photo.); Sabatier 8; Tolstoi, pl. 8, 18. It is clear from Sabatier’s drawing that X–XX in his catalogue (copied by Mattingly, p. 253) is highly doubtful; XV/XXX is certain on a number of pieces; on others, the figures seem to be XV and XX. Sabatier (no. 1) reports a medallion with VOT XXXV MVLT XXXX.

<sup>87</sup> Ratto 274; Tolstoi, pl. 9 (Zeno), 6.

<sup>88</sup> Ratto 291; Sabatier 3 (XXX in catalogue; cf. pl. VII, 19—XXXX; Tolstoi, pl. 10, 25).

<sup>89</sup> Ratto 323 (XXX); Sabatier 4; Tolstoi, pl. 12, 11; *BMC Byz.* I, pl. I, 3. Two pieces in the ANS collections clearly have XXXX (e. g., PLATE XIII, 132). Two-thirds of the specimens in the ANS photofile show XXXX; one-third are unreliable for the vota figures.

Justinus I, XXXX;<sup>90</sup> Justinian, XXX or XXXX.<sup>91</sup> Anastasius has also a VICTORIA AVGVSTORVM semmissis with VOT(a) P(opuli) C(onstantinopolitani),<sup>92</sup> besides semisses with XXX and XXXX.<sup>93</sup> Of silver vota issues there are pieces of Marcian, Leo I and Zeno with difficult inscriptions,<sup>94</sup> and Anastasius, Justin I and Justinian issued small silver bearing the evidently meaningless VOT MVL T MTI.<sup>95</sup> Dated coinage had actually ceased to exist. A memory of the old tradition of dated coinage returned briefly in the form of a hybrid or barbaric solidus of Leo which repeated a reverse type of Theodosius with IMP XXXXII COS XVII.<sup>96</sup> In any case, small wonder that Justinian, when he began to date his bronze coinage (from April, 538), introduced dating by regnal years.<sup>97</sup> This was not the only method of dating that was to appear on the Byzantine coinage,<sup>98</sup> but it was the simplest, most conspicuous, and the longest lasting. Abbreviated forms of acclamation wishing the emperor many years (MVL TOS ANNOS)<sup>99</sup> were yet to appear on some Byzantine solidi, but this is something different from the vota indications. The whole vota

<sup>90</sup> Ratto 387; Sabatier 3; Tolstoi, pl. 16, 18; *BMCByz.* I, pl. II, 12. The intention of the die-engravers seems to be to cut XXXX, but the figures are not always complete.

<sup>91</sup> Ratto 465; Sabatier 4 (drawing has XXX); Tolstoi, pl. 19, 44 f. (incomplete; both pieces unreliable as evidence for any definite vota number); *BMCByz.* I, pl. IV, 13 (XXX). Of specimens in the ANS photofile I note six as having XXXX, eight as unreliable.

<sup>92</sup> Sabatier 6; Tolstoi, pl. 15, 124.

<sup>93</sup> Ratto 323-5; Sabatier 4; Tolstoi, pls. 11, 12, nos. 10, 11. For all semisses mentioned here cf. Lafaurie's list, *Gallia, Suppl.* 12, p. 287.

<sup>94</sup> Marcian: VOT MVL T XXXX, Tolstoi 25; Leo: VOT XXXV MVL T XXXX?, a large silver medallion, Sabatier, pl. VII, 1; Zeno: TOV VIMV MTI, Ratto 297, Tolstoi, pl. 10, 33; Sabatier 10.

<sup>95</sup> Anastasius: *BMCByz.* I, pl. I, 6; Justinus I: Tolstoi, pl. 16, 26; Justinian I: *BMCByz.* I, pl. IX, 11-12 (HTI); see also p. 63, n. 4 and cf. pl. 9, 14; Ratto Cat. 474; cf. 476-8.

<sup>96</sup> Tolstoi, pl. 9, 42; COMOB, western issue. O. Ulrich-Bansa, "Note sulle monete dell'Augusta Aelia Licinia Eudoxia," *Numismatica*, 1935, p. 25, speaks of a barbaric imitation of Leo I with this legend and says that Marcian, too, had this dated legend.

<sup>97</sup> *BMCByz.* I, p. 30 ff. Cf. P. Grierson, "Dated Solidi of Maurice, Phocas, and Heraclius," *NC*, 1950, 49-50.

<sup>98</sup> *Ibid.*, pp. 49-70 and see also op. cit., "The Consular Coinage of Heraclius," pp. 71-93.

<sup>99</sup> *BMCByz.* II, pp. 332, 335, 358, 360, 363, 366, 378, 391.



coinage was dead, and on the lesser denominations where the vota had been recorded as a reverse type, some form of the cross had already intruded in those days when the last vota solidi of the Theodosian House were being struck. While it had maintained the custom of celebrating the imperial vows on the coinage to the end, the House of Theodosius at the height of its power had already begun to replace the vota numbers with new symbols, new traditions.

## KEY TO PLATES AND TEXT

ANS—The American Numismatic Society, New York

Ashmolean—The Ashmolean Museum, Oxford

BM—The British Museum

Berlin—Staatliche Museen, Münzkabinett

Metr. Mus.—Metropolitan Museum of Art, New York

Munich—Staatliche Münzsammlung

Paris—Cabinet des Médailles, Bibliothèque Nationale

Vienna—Münzkabinett, Kunsthistorisches Museum

Private collections are indicated by name.

Sale catalogues are indicated by dealer's name and date of sale.

Strict legend division for the long cross coinage has been generally ignored, and the usual eastern and western exergual letters CONOB and COMOB (also COB), including their barbaric variants, have been omitted. Eastern officina letters, however, have been included, as well as the abbreviated names of mints appearing on western issues. In the Diocletianic lists  $\Xi$  (= 60) has been used, though various forms appear on the coins. Missong, *ZfN* 7 (1880), p. 267 claimed to have found the classic form of this letter on a Berlin aureus, but Sutherland, *JRS* 51 (1961), p. 94 uses a variant form.

References in the last column of the "Key" are to pages and notes of this monograph.

## A NEW AUGUSTAN AUREUS OF 17 B.C.

I.	Augustus, A	M · SANQVINIVS · III · VIR	Comet	↑	7.8	Private Coll., Italy	I-II
2.	Augustus, A	M · SANQVINIVS · III · VIR	Secular Herald	↗	3.55	ANS (Gautier)	2, 3 n. 8, 6, 7 n. 10, n. 12, 8-II
3.	Augustus, A (plated)	M · SANQVINIVS · III · VIR	Secular Herald	↘	2.90	ANS (Husker)	2, 3 n. 8, 6, 7 n. 10, n. 12, 8-II
4.	Augustus, A; be- fore head, star	DIVOS IVLIVS		↑	24.29	ANS	3 n. 8
5.	Augustus, A	L LENTVLVS · FLAMEN MARTIALIS	Augustus (or the Flamen Martialis) is) placing star on statue of Divus Julius	↗	3.82	ANS (Newell)	7 n. 12
6.	Domitia	DIVVS CAESAR IMP.DOMITIANIF	Deified son of Do- mitian on globe amid stars			Gans, Mar. 9, 1954. 558	2 n. 5
7.	Domitian, A	COS XIII LVD SAEC FEC	Secular herald	↓	1.35	ANS (Newell)	2 n. 6, 7 n. 10
8.	Domitian, A	On cippus, COS XIII LVD SAEC FEC	Secular herald be- fore cippus re- cording Ludi Saeclares			ANS	2 n. 6, 7 n. 10, II

## THE DATED COINS OF POMPEIOPOLIS

9.	Reign of Tiberius (hd. Pompey)	↑	8.195	Dorsey Stephens	14, 15, 19-21
10.	Reign of Tiberius (hd. Pompey)	↑	10.32	BM	12-14, 19-21
11.	Nero	↑	6.47	Paris	16, 17 n., 19
12.	Nero	↑	7.48	Paris	16, 17 n., 19
13.	Domitian	↑	10.53	Paris	17-20, cf. 15
14.	Domitian (hd. Pompey)	↑	11.22	Paris	17-20, cf. 15
15.	Domitian (hd. Pompey)	↑	9.28	BM	17-20, cf. 15
16.	Domitian (hd. Pompey)	↑	14.40	Paris	15, 17-20
17.	Domitian (hd. Pompey)	↑	11.16	Ashmolean	15, 17-20
18.	Domitian	↑	9.15	Paris	17-20, cf. 15
19.	Domitian	↙	12.08	BM	17-20, cf. 15
20.	Hadrian	↑	11.68	ANS (Newell)	15, 19, 20
21.	Antoninus Pius	↗	12.73	Paris	20
22.	L. Verus	↑	3.77	Paris	20
23.	Julia Domna	↑	18.08	ANS (Newell)	20
24.	Septimius Severus	↑	32.58	ANS (Newell), Cahn 71, 913	20
25.	Caracalla	↗	13.64	Paris	20
26.	Diadumenian	↗	17.1	Vienna	20
27.	Julia Mamaea	↗	19.90	Paris	20
28.	Gordian III	↓	15.4	Vienna	16, 20
29.	Gordian III	↑	17.9	Vienna	16, 20
30.	Philip I	↗	12.29	Munich	16, 20
31.	Philip II		9.90	von Aulock	16, 20

# THE NINTH CONSULSHIP OF DIOCLETIAN AND THE CONSULAR REVERSE

32.	Diocletian	CONSVL VIII	SIS	↑	4.91	ANS (Access., 1949)	23, 24, 28
33.	Maximian	CONSVL V	SIS	↑	5.75	ANS (Newell)	28; not in Pink
34.	Diocletian	CONSVL III				Ratto, 1912, 1894	26
35.	Diocletian	CONSVL III		↑	5.38	ANS (Newell)	26
36.	Diocletian	CONSVL III				Glendining, Nov. 24, 1925, 165	26
37.	Diocletian	CONSVL III			5.35	Helbing, June, 1929, 3915	26
38.	Diocletian	CONSVL III				Schulman, May 5, 1913, 607	26, 27
39.	Diocletian						
40.	antoninianus			↑	4.17	ANS (Newell)	27
	Maximian						
	antoninianus			↓	3.73	ANS (Newell)	27
41.	Diocletian	CONSVL III	SMAΞ			Feuardent, June 16, 1924, 269	27
42.	Diocletian	CONSVL III	SMAΞ			Bourgey, Dec. 7, 1908, 555	
						("545" on pl. of cat.)	27
43.	Diocletian	CONSVL III	SMAΞ	↗		Dupriez, Apr. 7, 1913, 1634	27
44.	Diocletian	CONSVL V	SMAΞ*	↓	5.19	ANS (Mills, Metr. Mus. Loan)	27
45.	Maximian	CONSVL III	SMAΞ*	↓	5.42	ANS (Newell)	27
46.	Diocletian	CONSVL VI	SMAΞ*	↗	5.38	ANS (Newell)	27
47.	Maximian	CONSVL V	SMAΞ*		5.37	Hirsch 29 (1910), 1336	27
48.	Diocletian	CONSVL VII	SMAΞ*		5.35	Naville 3 (1922), 147	27
49.	Maximian	CONSVL VI	SMAΞ*		5.32	Hirsch 29 (1910), 1337	27
50.	Maximian	CONSVL VIII	SMAΞ*	↑	5.29	Berlin	27
51.	Antoninus Pius	COS III			7.36	Metr Mus. (Durkee), formerly on loan to ANS	30
52.	Antoninus Pius	COS III		↓	7.42	ANS (Newell), Hirsch 29 (1910), 1040	30
53.	Flavius Valerius	COS III		↑	6.4	Gift, E. Gordon, 1953; Hirsch 15.	

			↙	0.7	metr. Mus. (Durkee), formerly on loan to ANS	
55.	Geta Caesar	PONTIF COS II	↓	3.24	ANS (Gautier)	36
56.	Geta Caesar	PONTIF COS II	↑	3.05	ANS (Newell)	34
57.	Geta Caesar	PONTIF COS II	↑	3.32	ANS (Access., 1953)	34
58.	Geta Caesar	PONTIF COS II	↑	3.44	ANS (Access., 1953)	34, 35
59.	Geta Caesar	PONTIF COS II	↑	3.49	ANS (Newell)	34
60.	Geta Caesar	PONTIF COS II	↑	2.97	ANS (Newell)	34, 35
61.	Geta Caesar	PONTIF COS II	↓	3.43	ANS (Endicott)	34, 35
62.	Geta Caesar	PONTIF COS II	↑	3.44	ANS (Newell)	34
63.	Geta Caesar	PONTIF COS II	↑	3.15	ANS (Newell)	34
64.	Geta Caesar	PONTIF COS II	↓	3.39	ANS (Gautier)	34
65.	Geta Caesar	PONTIF COS II	↓	3.20	ANS (Access., 1953)	34
66.	Geta Caesar	PONTIF COS II	↑	3.01	ANS (Gautier)	34
67.	Geta Caesar	PONTIF COS II	↑	3.45	ANS (Newell)	34
68.	Geta Caesar	PONTIF COS II	↓	2.49	ANS (Access., 1953)	34
69.	Geta Caesar	PONTIF COS II	↓	3.47	ANS (Newell)	34
70.	Geta Caesar	PONTIF COS II	↑	3.65	ANS (Gautier)	34
71.	Geta Caesar	PONTIF COS II		3.32	F. Knobloch	34
72.	Geta Augustus	PONTIF TR P II COS II	↑	3.11	ANS (Gautier)	34, 35
73.	Geta Augustus	PONTIFEX COS II			Münzhdlg. Basel 6 (Mar. 18, 1936), 1856	34, 35
74.	Geta Caesar	PONTIF COS II			Hirsch 33 (1913), 1362	34, 35

A NEW SOLIDUS OF THEODOSIUS II AND OTHER VOTA SOLIDI OF THE PERIOD

96

*Festal and Dated Coins*

75.	Theodosius II	X/VOT/XX €	↓	4.47	ANS (Access., 1952)	43-48, 51, 74
76.	Honorius	XX/VOT/XXX I			Cahn 80, Feb. 27, 1933, 998. Now BM	43-45, 50-52
77.	Theodosius II	VOT/XV/MVL/XX			Ratto, Dec. 9, 1930, 152	46-48, 55-56, 74
78.	Arcadius	VOT/V/MVL/X H	↓	4.4	ANS (HSA)	49
79.	Arcadius	VOT/V/MVL/X S	↓	4.46	ANS (Newell)	49
80.	Arcadius	VOT/V/MVL/X Θ	↑	4.10	Fecht (on deposit, ANS)	49
81.	Arcadius	VOT/X/MVLT/XV I	↑	4.39	ANS (Gautier)	49
82.	Arcadius	XX/XXX	↓	4.35	ANS (Gautier)	49-50
83=88.	Honorius	VOT XX MVL T XXX €		4.45	Santamaria, Jan. 24, 1938, 1058	51, 52
84.	Honorius	VOT/XXX/MVL T/XXXX	↓	4.40	ANS (Newell)	50, 51, 53 n. 21, 54-58, 70, 74, 76-77, 78, 80
85.	Honorius	VOT XXX MVL T XXXX		4.48	Hirsch 29 (1910), 1542	50, 51, 53-54, 58, 70, 76
86.	Honorius	VICTORI AAVGGG R V	↑	4.44	ANS (Newell)	54, 59
87.	Theodosius II	VOT XX MVL T XXX A	↑	4.4	ANS (HSA)	59
88=83.	Honorius	VOT XX MVL T XXX €		4.45	Santamaria, Jan. 24, 1938, 1058	59
89.	Eudocia	VOT XX MVL T XXX I		4.47	Naville 13 (1928), 1552	59
90.	Eudocia	VOT XX MVL T XXX I		4.44	Naville 15 (1930), 2011	59
91.	Pulcheria	VOT XX MVL T XXX €		4.40	Hirsch 31 (May 6, 1912), 2060	50, 68

# Key to Plates and Text

97

92.	Pulcheria	VOT XX MVL T XXX	↓	4.27	Ratto, Dec. 9, 1930, 237	59, 68
93.	Pulcheria	VICTORI AAVGGG	↓	4.39	ANS (Newell)	67, 68
94.	Aelia Placidia (Galla Placidia)	VOT XX MVL T XXX I			ANS (ex Morgan); Stroz- zi 2001? (not illus.)	59, 60-64
95.	Galla Placidia	VOT XX MVL T XXX A Q		4.46	Hirsch 18 (1907), 1762; Hirsch 31 (1912), 2007	59, 63-67, 69
96.	Galla Placidia	VOT XX MVL T XXX R M		4.48	Hirsch 29 (1910), 1544	59, 63-67, 69
97.	Galla Placidia	VOT XX MVL T XXX R V	↓	4.42	ANS (Newell)	59, 63-67, 69
98.	Galla Placidia	VOT XX MVL T XXX R V	↓	4.35	ANS (HSA)	59, 63-67, 69
99.	Honorio	BONO REI PVBLICAE R V		4.48	Naville 3 (1922), 256	65
100.	Marcian	VICTORI AAVGGG	↓	4.44	ANS (Newell)	66-67, 68
101.	Valentinian III	VICTORI AAVGGG		4.44	Münzhdg. Basel, Mar. 18, 1936, 2088	66, 68
102.	Marcian	VICTORI AAVGGG H	↓	4.48	ANS (Newell)	67, 68
103.	Issued in the name of Theodosius II	VICTORI AAVGGG I (rev. of Marcian)	↓	4.35	ANS (Newell)	68
104.	Issued in the name of Theodosius II	VICTORI AAVGGGGG		4.39	Naville 15 (1930), 2009	68
105-108: <i>Solidi struck in the West in the Ostrogothic period.</i>						
105.	Anastasius	VICTORI AAVGGG Θ	↓	4.42	ANS (Newell)	68
In l. f., monogram indicating that this solidus was struck in Rome						
106.	Justinus I	VICTORI AAVGGG A	↓	4.5	ANS (Newell), <i>BMC Ostrog.</i> p. 48, 12-14.	68



107.	Justinian I	VICTOR IAAVGG A	↓	4.43	ANS (Parish) <i>BMC Ostrog.</i> pp. 60-61, 1-6	68
108.	Justinian I	VICTOR IAAVGG A	↓	4.49	ANS (Field) <i>BMC Ostrog.</i> p. 61, 4; pl. 7, 17 (same rev. die).	68

109: Said to be Gallic Gold

109.	Issued in the name of Anastasius	VICTORI AAVGGV	↓	4.25	ANS (Newell)	68
------	-------------------------------------	----------------	---	------	--------------	----

110: Said to be German Gold

110.	Libius Severus (tremissis)	VICTORI AAVGGG	↓	1.45	ANS (Newell)	68
------	-------------------------------	----------------	---	------	--------------	----

Whether this coin, one of two types of tremisses struck in the name of Libius Severus (L. Cesano, *Studi di Numismatica* I, 1940, pp. 93f.), is an imitation or not, it is notable for combining the type of a solidus struck before and after Libius Severus with the weight of a tremissis. It is of better style than the tremisses on pl. 5 of W. Reinhart's "Die Münzen des Tolosanischen Reiches der Westgoten," *Deutsches Jahrbuch für Numismatik* I (1938) and on pl. 2 of P. LeGentilhomme's "Le monnayage... dans les royaumes barbares en Occident," *RN* 1943, where similar tremisses struck in the name of Valentinian III are illustrated.

111.	Theodosius II	VOT XXX MVL T XXXX A	↓	4.48	ANS (Newell)	69-70, 71, 72
112. (= 111.)	Valentinian III	VOT XXX MVL T XXXX Γ	↓	4.41	ANS (Newell)	70, 71, 72, 76

113.	Theodosius II	VOT XX MVL T XXX	↑	4.44	BM	60-61, 71, 76, 77, 81
114.	Theodosius II	VOT XXX MVL T XXXX	↓	4.28	BM	70, 71, 72, 76, 77, 81
115.	Eudoxia, daughter of Theodosius II, wife of Valentinian an III	IMP XXXXII COS XVII	↓	4.0	Fecht (on deposit ANS)	
116.	Theodosius II	IMP XXXXII COS XVII	↓	4.4	ANS (Durkee) on loan from Metr. Mus.	72
117.	Theodosius II (copy?)	IMP XXXXII COS XVII	↓	4.41	ANS (Field)	72
118.	Theodosius II	IMP XXXXIII COS XVIII	↓		<i>Numismatique Listy</i> 1947, p. 65	72
119. (=112)	Valentinian III	VOT XXX MVL T XXXX Γ	↓	4.41	ANS (Newell)	73
120.	Valentinian III	VOT X MVL T XX R V			Santamaria, Jan. 24, 1938, 1080	75-78, 82
121.	Valentinian III	VOT X MVL T XX R M			Robt. Ball Fxd. Pr. Cat. 39 (1937), 2085	75-78, 80-81
122.	Valentinian III (semisis)	VOT/X/MVL T/XX R M	↓	2.08	ANS (Newell)	75-78, 80-81
123.	Valentinian III	VOT XXX MV LT XXXX R M			Münzhdg. Basel, Mar. 18, 1936, 2095 = Trau 4678?	75, 76
						75-80

	Valentinian III	VOTXXXMVLT XXXX R M		4.45	Hirsch 34 (1914), 1663	75-78, 80-87
124.	Valentinian III					
125.	Eudoxia, wife of Valentinian III	VOT XXX MV LTXXXX R M	↓	4.46	BM	81, 84
126.	Valerian	RESTITVTOR ORBIS	↑	2.35	ANS (Newell)	83
127.	Theodosius II (semissis)	XX/XXX?	↓	2.12	ANS (HSA)	88
128.	Theodosius II (semissis)	cross and XXXV	↓	2.25	ANS (Access., 1951)	88
129.	Theodosius II (semissis)	XXX/XXXX	↓	2.20	ANS (Access., 1951)	88
130.	Marcian (semissis)	cross and XXXV	↓	2.24	ANS (Access., 1951)	88
131.	Leo I (semissis)	XVXX? (+XXX intended?)	↓	2.19	ANS (Access., 1951)	88
132.	Anastasius (semissis)	XXXX	↓	2.20	ANS (Newell)	88
133.	Justinus I?	VOT/XXX/MVST/XXXX	↓	11.99	ANS (Newell)	88
134.	(Æ Med.)		↓	12.11		88
135.	Aemilian (sestertius)	VOTIS/DECENNA/LIBUS/ SC	↑	19.39	ANS (Newell)	
136.	Jovian (solidus)	VOT/V/MVLT/X *SIRM·	↓	4.35	ANS (HSA)	47 n. 11
137.	Honorius	VICTORI AAVGGG M D	↑	4.34	ANS (Newell)	47 n. 11
138.	Honorius	VICTORI AAVGGG R V	↓	4.34	ANS (Newell)	78, 80, 85 78, 80, 85

Key to Plates and Text

101

139.	Honorius	VICTORI AAVGGG R V different type	↑	4.32	ANS (HSA)	66, 78, 79, 80, 85, 86
140.	Johannes	VICTORI AAVGGG R V	↓	4.26	ANS (HSA)	78, 80, 85-86
141.	Valentinian III	VICTORI AAVGGG R V (rev. type of Honorius and Johannes)		4.43	Santamaria, Jan. 24, 1938, 1078; see also Glendining, May 27, 1936, 254 and Del- brueck, <i>Spätantike Kaiserporträts</i> , p. 98, nos 1 and 2	
142.	Valentinian III	VICTORI AAVGGG R V New type; Valentinian holding long cross and standing on human- headed serpent	✓	4.34	Fecht (on deposit ANS)	78, 85, 86
143.	Valentinian III	VICTORI AAVGGG R V	↑	4.53	ANS (Parish)	66, 79, 80, 85, 86
144.	Valentinian III	VICTORI AAVGGG R M	↑	4.45	ANS (Newell)	66, 79, 85, 87 66, 79, 85, 87
Labelled by Newell as struck in Africa by Geiseric.						
145.	Valentinian III	VICTORI AAVGGG M D			Ratto, June 7, 1926, 2732	66, 79, 85, 87
146.	Petronius Maximus	VICTORI AAVGGG R M	↑	4.41	ANS (Newell)	66, 85, 87
147.	Majorian	VICTORI AAVGGG A R	↓	4.33	ANS (HSA)	66, 85, 87
148.	Majorian	VICTORI AAVGGG M D	↓	4.33	ANS (Newell)	66, 85, 87

149.	Libius Severus	VICTORI AAVGGG R M	↓	4.42	ANS (HSA)	66, 85, 87
150.	Libius Severus	VICTORI AAVGGG R V	↓	4.40	ANS (Newell)	66, 85, 87
151.	Julius Nepos	VICTORI AAVGGG M D	↑	4.42	ANS (Newell)	67, 87
152.	Romulus Augustus (cast coin?)	VICTORI AAVGGG	↑	4.40	ANS (Newell)	67, 87

## PLATES



A



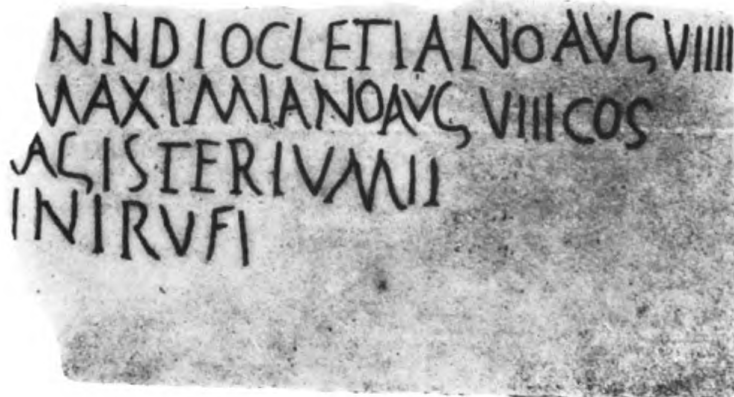
a

A NEW SOLIDUS OF THEODOSIUS II  
Enlargement of PLATE IX, 75.

b



A NEW AUGUSTAN AUREUS OF 17 B.C.  
A line of the inscription recording the Augustan  
Ludi Saeculares.



c

THE NINTH CONSULSHIP OF DIOCLETIAN  
Inscription with VIII [COS].



I



1



2

3



4

5



6

7

8

A NEW AUGUSTAN AUREUS OF 17 B.C.



### III



THE DATED COINS OF POMPEIOPOLIS



26



27



28



29



30



31



THE DATED COINS OF POMPEIOPOLIS

V



32



33



34



35



36



37



38



39



40



41



42



# THE NINTH CONSULSHIP OF DIOCLETIAN



Diocletian                      ANTIOCH                      Maximian  
THE NINTH CONSULSHIP OF DIOCLETIAN



# VII



Earlier Consular Types



Geta: PONTIF COS II  
THE NINTH CONSULSHIP OF DIOCLETIAN

VIII



63



64



65



66



67



68



69



70



71



72



73



74



Geta: PONTIF COS II - 63-71, 73, 74; PONTIF TR P II COS II-72.  
THE NINTH CONSULSHIP OF DIOCLETIAN



# IX



A NEW SOLIDUS OF THEODOSIUS II



Long Cross Coinage  
A NEW SOLIDUS OF THEODOSIUS II

XI



Long Cross Coinage  
A NEW SOLIDUS OF THEODOSIUS II



111



112



113



114



115



116



117



118



119



120



121



122



A NEW SOLIDUS OF THEODOSIUS II

# XIII



123



124



125



126



127



128



129



130



131



132



133

A NEW SOLIDUS OF THEODOSIUS II



A NEW SOLIDUS OF THEODOSIUS II



XV



143



144



145



146



147



148



149



150



151



152



A NEW SOLIDUS OF THEODOSIUS II

NUMISMATIC NOTES AND MONOGRAPHS

No. 154

CJ  
35  
N9  
no. 154

# METROLOGICAL TABLES

By EARLE R. CALEY



THE AMERICAN NUMISMATIC SOCIETY

NEW YORK

1965



# THE AMERICAN NUMISMATIC SOCIETY

*Founded 1858 · Incorporated 1865*

BROADWAY BETWEEN 155TH & 156TH STREETS  
NEW YORK, N.Y., 10032

**PURPOSES:** The Society was founded for the collection and preservation of coins, medals, decorations and paper money and for the investigation of their history and other subjects connected therewith.

**MEMBERSHIP:** Applications for membership are welcomed from all interested in numismatics. Inquiries regarding membership should be addressed to the Secretary of the Society.

**DUES:** The annual dues for an Associate Membership are \$10.00. Issues of the *Notes and Monographs*, *Museum Notes*, *Hispanic Numismatic Series*, and *Numismatic Literature* are distributed to all members.

**PUBLICATIONS:** The *Numismatic Notes and Monographs* consist of separately issued publications, each on a single topic, of which usually several appear each year. *The American Numismatic Society Museum Notes* is a publication, irregular in appearance, consisting of brief notes and papers, principally on items in the Society's collections. *Numismatic Literature* is a quarterly listing current numismatic publications with abstracts of their content. *Numismatic Studies* is a series accommodating works in a larger format. The *Hispanic Numismatic Series*, published in cooperation with the Hispanic Society of America, consists of publications devoted to the coinage of the Iberian Peninsula, and is based on the collections of the Hispanic Society.

**MUSEUM:** The Society maintains a museum located in uptown Manhattan, New York City, which houses its offices, collections and library. Collections embrace coins of all periods from their inception to modern times, medals and decorations. Selections from its cabinets are on display in an exhibition. The library, consisting of about 20,000 volumes, covers all branches of numismatics.

The museum is open to Members and the public on Tuesdays, Wednesdays, Thursdays, Fridays and Saturdays. It is closed on Sundays and Mondays and the following holidays: New Year's Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Election Day, Thanksgiving Day and Christmas Day. The hours of the Library are from 9 A.M. to 5 P.M. The public exhibition is open from 10 A.M. to 5 P.M.

# NUMISMATIC NOTES AND MONOGRAPHS

*Number* 154



# Metrological Tables

By EARLE R. <sup>Radcliffe</sup> CALEY



THE AMERICAN NUMISMATIC SOCIETY  
NEW YORK  
1965

CJ  
75  
.N9  
no. 154

**ALL RIGHTS RESERVED BY  
THE AMERICAN NUMISMATIC SOCIETY**

**PRINTED IN GERMANY  
AT J. J. AUGUSTIN · GLÜCKSTADT**

## TABLE OF CONTENTS

INTRODUCTION .....	vii
TABLE I — DECIMAL GRAINS TO GRAMS .....	I
TABLE II — PENNYWEIGHTS AND GRAINS TO GRAMS .....	73
TABLE III — TROY OUNCES AND PENNYWEIGHTS TO GRAMS ....	88
TABLE IV — FRACTIONAL PENNYWEIGHTS TO GRAMS .....	90
TABLE V — FRACTIONAL TROY OUNCES TO GRAMS .....	96
TABLE VI — ROMAN SCRUPLES TO GRAMS .....	97
TABLE VII — GRAMS TO ROMAN SCRUPLES .....	100
TABLE VIII — GRAMS TO ROMAN CARATS .....	103
TABLE IX — DECIMAL INCHES TO MILLIMETERS .....	107
TABLE X — FRACTIONAL INCHES TO MILLIMETERS .....	112
TABLE XI — WHOLE MILLIMETERS TO INCHES .....	116
TABLE XII — UNITS IN THE <i>American Scale</i> TO DECIMAL INCHES AND MILLIMETERS .....	118
TABLE XIII — UNITS IN <i>Mionnet's Scale</i> TO DECIMAL INCHES AND MILLIMETERS .....	119



## INTRODUCTION

One of the minor obstacles to research in numismatics is the use, by the authors of articles and books and by the compilers of catalogues, of diverse kinds of measuring units for indicating the size and weight of coins and medals. This diversity is very apparent in the numismatic publications of the nineteenth century, and still persists to some degree at the present time in those issued in Great Britain and the United States. Hence the research worker in numismatics finds that he must often convert figures based on one system into figures based on another, a task that becomes laborious when a considerable number of figures for measures and weights must be so treated. Since the metric system is now used consistently in the numismatic publications of Europe and Latin America and in a considerable proportion of those issued in Great Britain and the United States, the universal adoption of this single system in the near future would be very desirable. But even if this came about, the problem of converting figures based on other systems into those based on the metric system will always remain for those who have occasion to consult past numismatic publications. Up to the present time an adequate set of tables for making such conversions has not been available. The brief *Grains and Grammes* published by the British Museum in 1920 is very useful but not adequate for many figures encountered in practice. By means of the present set of tables widely ranging figures for size and weight based on other systems may be converted into corresponding metric figures with ease and rapidity. The tables may also be used for conversions in the reverse direction. Tables VII, VIII, and XI for the direct conversion of metric figures into other kinds are exceptional. The first two are included more especially for the construction of frequency tables in Roman units from the weights of coins in grams. The third is included because the conversion of sizes from millimeters to inches seems to be often desired by persons who do not readily visualize sizes expressed in these metric units.



Tables XII and XIII provide for the conversion into both inches and millimeters of figures based on two scales once much used but now obsolete. The *American Scale*, officially adopted in 1858 by the Numismatic Society of Philadelphia,<sup>1</sup> was widely used in the United States during the latter half of the nineteenth century. Its unit is the sixteenth of an inch. This scale as originally published by the society contained 64 units (PLATE I, 1), but since larger numbers of these units were occasionally used for indicating the size of large medals the range of Table XII covers 100 units of this scale. *Mionnet's Scale* named after the eminent French numismatist who suggested it,<sup>2</sup> was widely used in Europe during most of the nineteenth century and to some extent in Great Britain and the United States. As shown in PLATE I, 2, the scale in its original form consists of a series of numbered circles of increasing size all tangent at a single point. Unlike other scales for indicating the size of coins and medals, this scale, with its irregular divisions, does not appear to be based on any standard system of measures, and Mionnet did not explain the basis of his scale. Since he published it in connection with his works on ancient coins it is possible that the divisions of this scale correspond to what he found to be the most frequent distribution of the diameters of such coins.

Various modifications of *Mionnet's Scale* were published after the middle of the nineteenth century, some of which differ considerably from the original scale published by Mionnet. Leake<sup>3</sup> retained the original form of *Mionnet's Scale* but included only the first twelve divisions which he numbered in Roman numerals instead of Arabic numerals (PLATE II, 1). Moreover, as shown in Table A, the divisions of this abbreviated scale do not correspond exactly to those of the original scale. The measurements listed in this table and in Table B were made under magnification with an accurate steel rule. Dickeson<sup>4</sup>

<sup>1</sup> *Proceedings of the Numismatic and Antiquarian Society of Philadelphia* (1865-1866), Preface, p. 4. I am indebted to Francis D. Campbell of the American Numismatic Society library for this reference.

<sup>2</sup> Mionnet, T. E., *Description de Medailles Antiques* (Paris, 1805) Introduction p. xiii and plate illustration.

<sup>3</sup> Leake, W. M., *Numismata Hellenica* (London, 1854), Scale inserted on separate unnumbered slip.

<sup>4</sup> Dickeson, M. W., *The American Numismatic Manual* (Philadelphia, 1859), p. 30.

published a rectangular form of *Mionnet's Scale* (PLATE II, 2) but without making any reference to Mionnet or to the original form of his scale. As shown in Table A, some of the divisions of the scale published by Dickeson differ appreciably in size from those of the scale of Mionnet. Another difference is the added division. There can be no doubt, however, that the scale of Dickeson was derived from that of Mionnet. The rectangular form of *Mionnet's Scale* published by Dickeson was generally adopted by all later authors, probably because it was much easier to draw. However, some of the scales that were published later differ still more from the original scale, in particular the one published by Prime.<sup>5</sup> As shown in Table B, the sizes of most of the divisions of this scale differ radically from those of Mionnet, apparently because the scale divisions were by error numbered in the reverse order. When renumbered, the sizes of the divisions are much closer to those of *Mionnet's Scale*, though many still differ considerably. Much later in the nineteenth century Head<sup>6</sup> published a rectangular scale which he labelled as *Mionnet's Scale*. As shown in Table B, the sizes of the units of the scale published by Head are generally closer to those of the original scale published by Mionnet than are those of the earlier rectangular scales that have been mentioned. However, no exact agreement between the original scale of Mionnet and any of its later versions can be expected, even if such agreement was intended, because of the unavoidable variations in the lengths of scales printed on paper, for different kinds of this material change dimension to a different degree with changes in humidity.

In view of all these uncertainties, the dimensions of the units of *Mionnet's Scale* given in Table XIII are expressed only to the nearest 0.05 inch and the nearest 0.5 millimeter. Even these rounded values may be unnecessarily precise, for numismatists who used this scale ordinarily expressed the diameter of a given coin to the nearest whole unit when its size fell between two scale units, and but rarely used fractions of units. Such an approximation is especially to be expected when sizes of ancient coins are given in units of *Mionnet's scale*.

Prime, W. C., *Coins, Medals, and Seals* (New York, 1861), p. 239.

Head, B. V., *Historia Numorum* (Oxford, 1887), p. 808.

TABLE A

SIZES OF DIVISIONS OF MIONNET'S SCALE COMPARED WITH SIZES OF  
DIVISIONS OF CERTAIN SUBSEQUENT MODIFICATIONS

Scale No.	Original Size (mm.)	Size According to Leake (mm.)	Size According to Dickeson (mm.)
1	8.9	9.3	9.5
2	12.1	12.1	12.5
3	15.4	15.3	15.3
4	18.1	18.1	18.3
5	21.2	21.2	21.3
6	23.7	23.8	24.2
7	26.6	26.6	26.6
8	28.9	28.8	28.9
9	31.8	31.4	31.3
10	35.2	34.9	33.9
11	37.7	37.5	36.5
12	40.5	39.7	39.0
13	43.4		42.1
14	51.8		50.4
15	56.7		54.9
16	60.6		58.7
17	64.5		62.8
18	70.9		68.8
19	78.3		75.9
20			83.1

TABLE B

SIZES OF DIVISIONS OF TWO LATER RECTANGULAR FORMS OF MIONNET'S  
SCALE COMPARED WITH SIZES OF THE DIVISIONS OF THE ORIGINAL SCALE

Scale No.	Original Size (mm.)	Size According to Prime		Size According to Head (mm.)
		As Published (mm.)	Reversed (mm.)	
1	8.9	7.5	7.5	9.3
2	12.1	14.0	10.5	12.3
3	15.4	20.1	13.5	15.3
4	18.1	24.2	16.3	17.8
5	21.2	28.2	19.2	21.0
6	23.7	32.1	21.8	23.9
7	26.6	40.4	24.3	26.1
8	28.9	43.0	27.0	28.4
9	31.8	45.7	29.8	31.2
10	35.2	48.3	33.8	34.7
11	37.7	52.3	36.4	37.5
12	40.5	55.1	39.1	39.7
13	43.4	57.8	41.7	43.2
14	51.8	60.3	50.0	51.0
15	56.7	62.9	53.9	55.9
16	60.6	65.8	57.9	60.1
17	64.5	68.6	62.0	63.2
18	70.9	71.6	68.1	69.8
19	78.3	74.6	74.6	77.0
20		82.1	82.1	



TABLE I  
DECIMAL GRAINS TO GRAMS

0.1—10.0

0.01—0.65

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
0.1	0.01	2.6	0.17	5.1	0.33	7.6	0.49
.2	0.01	.7	0.18	.2	0.34	.7	0.50
.3	0.02	.8	0.18	.3	0.34	.8	0.51
.4	0.03	.9	0.19	.4	0.35	.9	0.51
.5	0.03	3.0	0.19	.5	0.36	8.0	0.52
.6	0.04	.1	0.20	.6	0.36	.1	0.53
.7	0.05	.2	0.21	.7	0.37	.2	0.53
.8	0.05	.3	0.21	.8	0.38	.3	0.54
.9	0.06	.4	0.22	.9	0.38	.4	0.54
1.0	0.07	.5	0.23	6.0	0.39	.5	0.55
.1	0.07	.6	0.23	.1	0.40	.6	0.56
.2	0.08	.7	0.24	.2	0.40	.7	0.56
.3	0.08	.8	0.25	.3	0.41	.8	0.57
.4	0.09	.9	0.25	.4	0.42	.9	0.58
.5	0.10	4.0	0.26	.5	0.42	9.0	0.58
.6	0.10	.1	0.27	.6	0.43	.1	0.59
.7	0.11	.2	0.27	.7	0.43	.2	0.60
.8	0.12	.3	0.28	.8	0.44	.3	0.60
.9	0.12	.4	0.29	.9	0.45	.4	0.61
2.0	0.13	.5	0.29	7.0	0.45	.5	0.62
.1	0.14	.6	0.30	.1	0.46	.6	0.62
.2	0.14	.7	0.31	.2	0.47	.7	0.63
.3	0.15	.8	0.31	.3	0.47	.8	0.64
.4	0.16	.9	0.32	.4	0.48	.9	0.64
.5	0.16	5.0	0.32	.5	0.49	10.0	0.65

I

I

10.1—24.0

0.66—1.56

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
10.1	0.66	13.6	0.88	17.1	1.11	20.6	1.34
.2	0.66	.7	0.89	.2	1.12	.7	1.34
.3	0.67	.8	0.89	.3	1.12	.8	1.35
.4	0.67	.9	0.90	.4	1.13	.9	1.35
.5	0.68	14.0	0.91	.5	1.13	21.0	1.36
.6	0.69	.1	0.91	.6	1.14	.1	1.37
.7	0.69	.2	0.92	.7	1.15	.2	1.37
.8	0.70	.3	0.93	.8	1.15	.3	1.38
.9	0.71	.4	0.93	.9	1.16	.4	1.39
11.0	0.71	.5	0.94	18.0	1.17	.5	1.39
.1	0.72	.6	0.95	.1	1.17	.6	1.40
.2	0.73	.7	0.95	.2	1.18	.7	1.41
.3	0.73	.8	0.96	.3	1.19	.8	1.41
.4	0.74	.9	0.97	.4	1.19	.9	1.42
.5	0.75	15.0	0.97	.5	1.20	22.0	1.43
.6	0.75	.1	0.98	.6	1.21	.1	1.43
.7	0.76	.2	0.99	.7	1.21	.2	1.44
.8	0.77	.3	0.99	.8	1.22	.3	1.45
.9	0.77	.4	1.00	.9	1.23	.4	1.45
12.0	0.78	.5	1.00	19.0	1.23	.5	1.46
.1	0.78	.6	1.01	.1	1.24	.6	1.47
.2	0.79	.7	1.02	.2	1.24	.7	1.47
.3	0.80	.8	1.02	.3	1.25	.8	1.48
.4	0.80	.9	1.03	.4	1.26	.9	1.48
.5	0.81	16.0	1.04	.5	1.26	23.0	1.49
.6	0.82	.1	1.04	.6	1.27	.1	1.50
.7	0.82	.2	1.05	.7	1.28	.2	1.50
.8	0.83	.3	1.06	.8	1.28	.3	1.51
.9	0.84	.4	1.06	.9	1.29	.4	1.52
13.0	0.84	.5	1.07	20.0	1.30	.5	1.52
.1	0.85	.6	1.08	.1	1.30	.6	1.53
.2	0.86	.7	1.08	.2	1.31	.7	1.54
.3	0.86	.8	1.09	.3	1.32	.8	1.54
.4	0.87	.9	1.10	.4	1.32	.9	1.55
.5	0.88	17.0	1.10	.5	1.33	24.0	1.56

# Decimal Grains to Grams

3

24.1—38.0

1.56—2.46

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
24.1	1.56	27.6	1.79	31.1	2.02	34.6	2.24
.2	1.57	.7	1.80	.2	2.02	.7	2.25
.3	1.58	.8	1.80	.3	2.03	.8	2.26
.4	1.58	.9	1.81	.4	2.04	.9	2.26
.5	1.59	28.0	1.81	.5	2.04	35.0	2.27
.6	1.59	.1	1.82	.6	2.05	.1	2.28
.7	1.60	.2	1.83	.7	2.05	.2	2.28
.8	1.61	.3	1.83	.8	2.06	.3	2.29
.9	1.61	.4	1.84	.9	2.07	.4	2.29
25.0	1.62	.5	1.85	32.0	2.07	.5	2.30
.1	1.63	.6	1.85	.1	2.08	.6	2.31
.2	1.63	.7	1.86	.2	2.09	.7	2.31
.3	1.64	.8	1.87	.3	2.09	.8	2.32
.4	1.65	.9	1.87	.4	2.10	.9	2.33
.5	1.65	29.0	1.88	.5	2.11	36.0	2.33
.6	1.66	.1	1.89	.6	2.11	.1	2.34
.7	1.67	.2	1.89	.7	2.12	.2	2.35
.8	1.67	.3	1.90	.8	2.13	.3	2.35
.9	1.68	.4	1.91	.9	2.13	.4	2.36
26.0	1.69	.5	1.91	33.0	2.14	.5	2.37
.1	1.69	.6	1.92	.1	2.15	.6	2.37
.2	1.70	.7	1.93	.2	2.15	.7	2.38
.3	1.70	.8	1.93	.3	2.16	.8	2.39
.4	1.71	.9	1.94	.4	2.16	.9	2.39
.5	1.72	30.0	1.94	.5	2.17	37.0	2.40
.6	1.72	.1	1.95	.6	2.18	.1	2.40
.7	1.73	.2	1.96	.7	2.18	.2	2.41
.8	1.74	.3	1.96	.8	2.19	.3	2.42
.9	1.74	.4	1.97	.9	2.20	.4	2.42
27.0	1.75	.5	1.98	34.0	2.20	.5	2.43
.1	1.76	.6	1.98	.1	2.21	.6	2.44
.2	1.76	.7	1.99	.2	2.22	.7	2.44
.3	1.77	.8	2.00	.3	2.22	.8	2.45
.4	1.78	.9	2.00	.4	2.23	.9	2.46
.5	1.78	31.0	2.01	.5	2.24	38.0	2.46

1\*



38.1—52.0

2.47—3.37

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
38.1	2.47	41.6	2.70	45.1	2.92	48.6	3.15
.2	2.48	.7	2.70	.2	2.93	.7	3.16
.3	2.48	.8	2.71	.3	2.94	.8	3.16
.4	2.49	.9	2.72	.4	2.94	.9	3.17
.5	2.50	42.0	2.72	.5	2.95	49.0	3.18
.6	2.50	.1	2.73	.6	2.96	.1	3.18
.7	2.51	.2	2.74	.7	2.96	.2	3.19
.8	2.51	.3	2.74	.8	2.97	.3	3.20
.9	2.52	.4	2.75	.9	2.97	.4	3.20
39.0	2.53	.5	2.75	46.0	2.98	.5	3.21
.1	2.53	.6	2.76	.1	2.99	.6	3.21
.2	2.54	.7	2.77	.2	2.99	.7	3.22
.3	2.55	.8	2.77	.3	3.00	.8	3.23
.4	2.55	.9	2.78	.4	3.01	.9	3.23
.5	2.56	43.0	2.79	.5	3.01	50.0	3.24
.6	2.57	.1	2.79	.6	3.02	.1	3.25
.7	2.57	.2	2.80	.7	3.03	.2	3.25
.8	2.58	.3	2.81	.8	3.03	.3	3.26
.9	2.59	.4	2.81	.9	3.04	.4	3.27
40.0	2.59	.5	2.82	47.0	3.05	.5	3.27
.1	2.60	.6	2.83	.1	3.05	.6	3.28
.2	2.61	.7	2.83	.2	3.06	.7	3.29
.3	2.61	.8	2.84	.3	3.07	.8	3.29
.4	2.62	.9	2.85	.4	3.07	.9	3.30
.5	2.62	44.0	2.85	.5	3.08	51.0	3.31
.6	2.63	.1	2.86	.6	3.08	.1	3.31
.7	2.64	.2	2.86	.7	3.09	.2	3.32
.8	2.64	.3	2.87	.8	3.10	.3	3.32
.9	2.65	.4	2.88	.9	3.10	.4	3.33
41.0	2.66	.5	2.88	48.0	3.11	.5	3.34
.1	2.66	.6	2.89	.1	3.12	.6	3.34
.2	2.67	.7	2.90	.2	3.12	.7	3.35
.3	2.68	.8	2.90	.3	3.13	.8	3.36
.4	2.68	.9	2.91	.4	3.14	.9	3.36
.5	2.69	45.0	2.92	.5	3.14	52.0	3.37

# Decimal Grains to Grams

5

52.1—66.0

3.38—4.28

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
52.1	3.38	55.6	3.60	59.1	3.83	62.6	4.06
.2	3.38	.7	3.61	.2	3.84	.7	4.06
.3	3.39	.8	3.62	.3	3.84	.8	4.07
.4	3.40	.9	3.62	.4	3.85	.9	4.08
.5	3.40	56.0	3.63	.5	3.86	63.0	4.08
.6	3.41	.1	3.64	.6	3.86	.1	4.09
.7	3.42	.2	3.64	.7	3.87	.2	4.10
.8	3.42	.3	3.65	.8	3.88	.3	4.10
.9	3.43	.4	3.66	.9	3.88	.4	4.11
53.0	3.43	.5	3.66	60.0	3.89	.5	4.12
.1	3.44	.6	3.67	.1	3.89	.6	4.12
.2	3.45	.7	3.67	.2	3.90	.7	4.13
.3	3.45	.8	3.68	.3	3.91	.8	4.13
.4	3.46	.9	3.69	.4	3.91	.9	4.14
.5	3.47	57.0	3.69	.5	3.92	64.0	4.15
.6	3.47	.1	3.70	.6	3.93	.1	4.15
.7	3.48	.2	3.71	.7	3.93	.2	4.16
.8	3.49	.3	3.71	.8	3.94	.3	4.17
.9	3.49	.4	3.72	.9	3.95	.4	4.17
54.0	3.50	.5	3.73	61.0	3.95	.5	4.18
.1	3.51	.6	3.73	.1	3.96	.6	4.19
.2	3.51	.7	3.74	.2	3.97	.7	4.19
.3	3.52	.8	3.75	.3	3.97	.8	4.20
.4	3.53	.9	3.75	.4	3.98	.9	4.21
.5	3.53	58.0	3.76	.5	3.99	65.0	4.21
.6	3.54	.1	3.77	.6	3.99	.1	4.22
.7	3.55	.2	3.77	.7	4.00	.2	4.23
.8	3.55	.3	3.78	.8	4.01	.3	4.23
.9	3.56	.4	3.78	.9	4.01	.4	4.24
55.0	3.56	.5	3.79	62.0	4.02	.5	4.24
.1	3.57	.6	3.80	.1	4.02	.6	4.25
.2	3.58	.7	3.80	.2	4.03	.7	4.26
.3	3.58	.8	3.81	.3	4.04	.8	4.26
.4	3.59	.9	3.82	.4	4.04	.9	4.27
.5	3.60	59.0	3.82	.5	4.05	66.0	4.28

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
66.1	4.28	69.6	4.51	73.1	4.74	76.6	4.96
.2	4.29	.7	4.52	.2	4.74	.7	4.97
.3	4.30	.8	4.52	.3	4.75	.8	4.98
.4	4.30	.9	4.53	.4	4.76	.9	4.98
.5	4.31	70.0	4.54	.5	4.76	77.0	4.99
.6	4.32	.1	4.54	.6	4.77	.1	5.00
.7	4.32	.2	4.55	.7	4.78	.2	5.00
.8	4.33	.3	4.56	.8	4.78	.3	5.01
.9	4.34	.4	4.56	.9	4.79	.4	5.02
67.0	4.34	.5	4.57	74.0	4.80	.5	5.02
.1	4.35	.6	4.58	.1	4.80	.6	5.03
.2	4.36	.7	4.58	.2	4.81	.7	5.04
.3	4.36	.8	4.59	.3	4.82	.8	5.04
.4	4.37	.9	4.59	.4	4.82	.9	5.05
.5	4.37	71.0	4.60	.5	4.83	78.0	5.05
.6	4.38	.1	4.61	.6	4.83	.1	5.06
.7	4.39	.2	4.61	.7	4.84	.2	5.07
.8	4.39	.3	4.62	.8	4.85	.3	5.07
.9	4.40	.4	4.63	.9	4.85	.4	5.08
68.0	4.41	.5	4.63	75.0	4.86	.5	5.09
.1	4.41	.6	4.64	.1	4.87	.6	5.09
.2	4.42	.7	4.65	.2	4.87	.7	5.10
.3	4.43	.8	4.65	.3	4.88	.8	5.11
.4	4.43	.9	4.66	.4	4.89	.9	5.11
.5	4.44	72.0	4.67	.5	4.89	79.0	5.12
.6	4.45	.1	4.67	.6	4.90	.1	5.13
.7	4.45	.2	4.68	.7	4.91	.2	5.13
.8	4.46	.3	4.69	.8	4.91	.3	5.14
.9	4.47	.4	4.69	.9	4.92	.4	5.15
69.0	4.47	.5	4.70	76.0	4.93	.5	5.15
.1	4.48	.6	4.70	.1	4.93	.6	5.16
.2	4.48	.7	4.71	.2	4.94	.7	5.17
.3	4.49	.8	4.72	.3	4.94	.8	5.17
.4	4.50	.9	4.72	.4	4.95	.9	5.18
.5	4.50	73.0	4.73	.5	4.96	80.0	5.18

Decimal Grains to Grams

7

80.1—94.0

5.19—6.09

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
80.1	5.19	83.6	5.42	87.1	5.64	90.6	5.87
.2	5.20	.7	5.42	.2	5.65	.7	5.88
.3	5.20	.8	5.43	.3	5.66	.8	5.88
.4	5.21	.9	5.44	.4	5.66	.9	5.89
.5	5.22	84.0	5.44	.5	5.67	91.0	5.90
.6	5.22	.1	5.45	.6	5.68	.1	5.90
.7	5.23	.2	5.46	.7	5.68	.2	5.91
.8	5.24	.3	5.46	.8	5.69	.3	5.92
.9	5.24	.4	5.47	.9	5.70	.4	5.92
81.0	5.25	.5	5.48	88.0	5.70	.5	5.93
.1	5.26	.6	5.48	.1	5.71	.6	5.94
.2	5.26	.7	5.49	.2	5.72	.7	5.94
.3	5.27	.8	5.50	.3	5.72	.8	5.95
.4	5.28	.9	5.50	.4	5.73	.9	5.96
.5	5.28	85.0	5.51	.5	5.74	92.0	5.96
.6	5.29	.1	5.51	.6	5.74	.1	5.97
.7	5.29	.2	5.52	.7	5.75	.2	5.98
.8	5.30	.3	5.53	.8	5.75	.3	5.98
.9	5.31	.4	5.53	.9	5.76	.4	5.99
82.0	5.31	.5	5.54	89.0	5.77	.5	5.99
.1	5.32	.6	5.55	.1	5.77	.6	6.00
.2	5.33	.7	5.55	.2	5.78	.7	6.01
.3	5.33	.8	5.56	.3	5.79	.8	6.01
.4	5.34	.9	5.57	.4	5.79	.9	6.02
.5	5.35	86.0	5.57	.5	5.80	93.0	6.03
.6	5.35	.1	5.58	.6	5.81	.1	6.03
.7	5.36	.2	5.59	.7	5.81	.2	6.04
.8	5.37	.3	5.59	.8	5.82	.3	6.05
.9	5.37	.4	5.60	.9	5.83	.4	6.05
83.0	5.38	.5	5.61	90.0	5.83	.5	6.06
.1	5.39	.6	5.61	.1	5.84	.6	6.07
.2	5.39	.7	5.62	.2	5.85	.7	6.07
.3	5.40	.8	5.63	.3	5.85	.8	6.08
.4	5.40	.9	5.63	.4	5.86	.9	6.09
.5	5.41	87.0	5.64	.5	5.86	94.0	6.09

94.1—108.0

6.10—7.00

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
94.1	6.10	97.6	6.32	101.1	6.55	104.6	6.78
.2	6.10	.7	6.33	.2	6.56	.7	6.79
.3	6.11	.8	6.34	.3	6.56	.8	6.79
.4	6.12	.9	6.34	.4	6.57	.9	6.80
.5	6.12	98.0	6.35	.5	6.58	105.0	6.80
.6	6.13	.1	6.36	.6	6.58	.1	6.81
.7	6.14	.2	6.36	.7	6.59	.2	6.82
.8	6.14	.3	6.37	.8	6.60	.3	6.82
.9	6.15	.4	6.38	.9	6.60	.4	6.83
95.0	6.16	.5	6.38	102.0	6.61	.5	6.84
.1	6.16	.6	6.39	.1	6.62	.6	6.84
.2	6.17	.7	6.40	.2	6.62	.7	6.85
.3	6.18	.8	6.40	.3	6.63	.8	6.86
.4	6.18	.9	6.41	.4	6.64	.9	6.86
.5	6.19	99.0	6.42	.5	6.64	106.0	6.87
.6	6.20	.1	6.42	.6	6.65	.1	6.88
.7	6.20	.2	6.43	.7	6.66	.2	6.88
.8	6.21	.3	6.44	.8	6.66	.3	6.89
.9	6.21	.4	6.44	.9	6.67	.4	6.90
96.0	6.22	.5	6.45	103.0	6.67	.5	6.90
.1	6.23	.6	6.45	.1	6.68	.6	6.91
.2	6.23	.7	6.46	.2	6.69	.7	6.91
.3	6.24	.8	6.47	.3	6.69	.8	6.92
.4	6.25	.9	6.47	.4	6.70	.9	6.93
.5	6.25	100.0	6.48	.5	6.71	107.0	6.93
.6	6.26	.1	6.49	.6	6.71	.1	6.94
.7	6.27	.2	6.49	.7	6.72	.2	6.95
.8	6.27	.3	6.50	.8	6.73	.3	6.95
.9	6.28	.4	6.51	.9	6.73	.4	6.96
97.0	6.29	.5	6.51	104.0	6.74	.5	6.97
.1	6.29	.6	6.52	.1	6.75	.6	6.97
.2	6.30	.7	6.53	.2	6.75	.7	6.98
.3	6.31	.8	6.53	.3	6.76	.8	6.99
.4	6.31	.9	6.54	.4	6.77	.9	6.99
.5	6.32	101.0	6.55	.5	6.77	108.0	7.00

Decimal Grains to Grams

9

108.1—122.0

7.01—7.91

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
108.1	7.01	111.6	7.23	115.1	7.46	118.6	7.69
.2	7.01	.7	7.24	.2	7.47	.7	7.69
.3	7.02	.8	7.25	.3	7.47	.8	7.70
.4	7.02	.9	7.25	.4	7.48	.9	7.71
.5	7.03	112.0	7.26	.5	7.48	119.0	7.71
.6	7.04	.1	7.26	.6	7.49	.1	7.72
.7	7.04	.2	7.27	.7	7.50	.2	7.72
.8	7.05	.3	7.28	.8	7.50	.3	7.73
.9	7.06	.4	7.28	.9	7.51	.4	7.74
109.0	7.06	.5	7.29	116.0	7.52	.5	7.74
.1	7.07	.6	7.30	.1	7.52	.6	7.75
.2	7.08	.7	7.30	.2	7.53	.7	7.76
.3	7.08	.8	7.31	.3	7.54	.8	7.76
.4	7.09	.9	7.32	.4	7.54	.9	7.77
.5	7.10	113.0	7.32	.5	7.55	120.0	7.78
.6	7.10	.1	7.33	.6	7.56	.1	7.78
.7	7.11	.2	7.34	.7	7.56	.2	7.79
.8	7.12	.3	7.34	.8	7.57	.3	7.80
.9	7.12	.4	7.35	.9	7.58	.4	7.80
110.0	7.13	.5	7.36	117.0	7.58	.5	7.81
.1	7.13	.6	7.36	.1	7.59	.6	7.82
.2	7.14	.7	7.37	.2	7.59	.7	7.82
.3	7.15	.8	7.37	.3	7.60	.8	7.83
.4	7.15	.9	7.38	.4	7.61	.9	7.83
.5	7.16	114.0	7.39	.5	7.61	121.0	7.84
.6	7.17	.1	7.39	.6	7.62	.1	7.85
.7	7.17	.2	7.40	.7	7.63	.2	7.85
.8	7.18	.3	7.41	.8	7.63	.3	7.86
.9	7.19	.4	7.41	.9	7.64	.4	7.87
111.0	7.19	.5	7.42	118.0	7.65	.5	7.87
.1	7.20	.6	7.43	.1	7.65	.6	7.88
.2	7.21	.7	7.43	.2	7.66	.7	7.89
.3	7.21	.8	7.44	.3	7.67	.8	7.89
.4	7.22	.9	7.45	.4	7.67	.9	7.90
.5	7.23	115.0	7.45	.5	7.68	122.0	7.91

122.1—136.0

7.91—8.81

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
122.1	7.91	125.6	8.14	129.1	8.37	132.6	8.59
.2	7.92	.7	8.15	.2	8.37	.7	8.60
.3	7.93	.8	8.15	.3	8.38	.8	8.61
.4	7.93	.9	8.16	.4	8.39	.9	8.61
.5	7.94	126.0	8.17	.5	8.39	133.0	8.62
.6	7.94	.1	8.17	.6	8.40	.1	8.63
.7	7.95	.2	8.18	.7	8.40	.2	8.63
.8	7.96	.3	8.18	.8	8.41	.3	8.64
.9	7.96	.4	8.19	.9	8.42	.4	8.64
123.0	7.97	.5	8.20	130.0	8.42	.5	8.65
.1	7.98	.6	8.20	.1	8.43	.6	8.66
.2	7.98	.7	8.21	.2	8.44	.7	8.66
.3	7.99	.8	8.22	.3	8.44	.8	8.67
.4	8.00	.9	8.22	.4	8.45	.9	8.68
.5	8.00	127.0	8.23	.5	8.46	134.0	8.68
.6	8.01	.1	8.24	.6	8.46	.1	8.69
.7	8.02	.2	8.24	.7	8.47	.2	8.70
.8	8.02	.3	8.25	.8	8.48	.3	8.70
.9	8.03	.4	8.26	.9	8.48	.4	8.71
124.0	8.04	.5	8.26	131.0	8.49	.5	8.72
.1	8.04	.6	8.27	.1	8.50	.6	8.72
.2	8.05	.7	8.28	.2	8.50	.7	8.73
.3	8.06	.8	8.28	.3	8.51	.8	8.74
.4	8.06	.9	8.29	.4	8.52	.9	8.74
.5	8.07	128.0	8.29	.5	8.52	135.0	8.75
.6	8.07	.1	8.30	.6	8.53	.1	8.75
.7	8.08	.2	8.31	.7	8.53	.2	8.76
.8	8.09	.3	8.31	.8	8.54	.3	8.77
.9	8.09	.4	8.32	.9	8.55	.4	8.77
125.0	8.10	.5	8.33	132.0	8.55	.5	8.78
.1	8.11	.6	8.33	.1	8.56	.6	8.79
.2	8.11	.7	8.34	.2	8.57	.7	8.79
.3	8.12	.8	8.35	.3	8.57	.8	8.80
.4	8.13	.9	8.35	.4	8.58	.9	8.81
.5	8.13	129.0	8.36	.5	8.59	136.0	8.81

*Decimal Grains to Grams*

II

136.1—150.0

8.82—9.72

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
136.1	8.82	139.6	9.05	143.1	9.27	146.6	9.50
.2	8.83	.7	9.05	.2	9.28	.7	9.51
.3	8.83	.8	9.06	.3	9.29	.8	9.51
.4	8.84	.9	9.07	.4	9.29	.9	9.52
.5	8.85	140.0	9.07	.5	9.30	147.0	9.53
.6	8.85	.1	9.08	.6	9.31	.1	9.53
.7	8.86	.2	9.09	.7	9.31	.2	9.54
.8	8.87	.3	9.09	.8	9.32	.3	9.55
.9	8.87	.4	9.10	.9	9.33	.4	9.55
137.0	8.88	.5	9.10	144.0	9.33	.5	9.56
.1	8.88	.6	9.11	.1	9.34	.6	9.56
.2	8.89	.7	9.12	.2	9.34	.7	9.57
.3	8.90	.8	9.12	.3	9.35	.8	9.58
.4	8.90	.9	9.13	.4	9.36	.9	9.58
.5	8.91	141.0	9.14	.5	9.36	148.0	9.59
.6	8.92	.1	9.14	.6	9.37	.1	9.60
.7	8.92	.2	9.15	.7	9.38	.2	9.60
.8	8.93	.3	9.16	.8	9.38	.3	9.61
.9	8.94	.4	9.16	.9	9.39	.4	9.62
138.0	8.94	.5	9.17	145.0	9.40	.5	9.62
.1	8.95	.6	9.18	.1	9.40	.6	9.63
.2	8.96	.7	9.18	.2	9.41	.7	9.64
.3	8.96	.8	9.19	.3	9.42	.8	9.64
.4	8.97	.9	9.20	.4	9.42	.9	9.65
.5	8.98	142.0	9.20	.5	9.43	149.0	9.66
.6	8.98	.1	9.21	.6	9.44	.1	9.66
.7	8.99	.2	9.21	.7	9.44	.2	9.67
.8	8.99	.3	9.22	.8	9.45	.3	9.68
.9	9.00	.4	9.23	.9	9.45	.4	9.68
139.0	9.01	.5	9.23	146.0	9.46	.5	9.69
.1	9.01	.6	9.24	.1	9.47	.6	9.69
.2	9.02	.7	9.25	.2	9.47	.7	9.70
.3	9.03	.8	9.25	.3	9.48	.8	9.71
.4	9.03	.9	9.26	.4	9.49	.9	9.71
.5	9.04	143.0	9.27	.5	9.49	150.0	9.72



150.1—164.0

9.73—10.63

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
150.1	9.73	153.6	9.95	157.1	10.18	160.6	10.41
.2	9.73	.7	9.96	.2	10.19	.7	10.41
.3	9.74	.8	9.97	.3	10.19	.8	10.42
.4	9.75	.9	9.97	.4	10.20	.9	10.43
.5	9.75	154.0	9.98	.5	10.21	161.0	10.43
.6	9.76	.1	9.99	.6	10.21	.1	10.44
.7	9.77	.2	9.99	.7	10.22	.2	10.45
.8	9.77	.3	10.00	.8	10.23	.3	10.45
.9	9.78	.4	10.01	.9	10.23	.4	10.46
151.0	9.79	.5	10.01	158.0	10.24	.5	10.47
.1	9.79	.6	10.02	.1	10.25	.6	10.47
.2	9.80	.7	10.02	.2	10.25	.7	10.48
.3	9.80	.8	10.03	.3	10.26	.8	10.49
.4	9.81	.9	10.04	.4	10.26	.9	10.49
.5	9.82	155.0	10.04	.5	10.27	162.0	10.50
.6	9.82	.1	10.05	.6	10.28	.1	10.50
.7	9.83	.2	10.06	.7	10.28	.2	10.51
.8	9.84	.3	10.06	.8	10.29	.3	10.52
.9	9.84	.4	10.07	.9	10.30	.4	10.52
152.0	9.85	.5	10.08	159.0	10.30	.5	10.53
.1	9.86	.6	10.08	.1	10.31	.6	10.54
.2	9.86	.7	10.09	.2	10.32	.7	10.54
.3	9.87	.8	10.10	.3	10.32	.8	10.55
.4	9.88	.9	10.10	.4	10.33	.9	10.56
.5	9.88	156.0	10.11	.5	10.34	163.0	10.56
.6	9.89	.1	10.12	.6	10.34	.1	10.57
.7	9.90	.2	10.12	.7	10.35	.2	10.58
.8	9.90	.3	10.13	.8	10.36	.3	10.58
.9	9.91	.4	10.14	.9	10.36	.4	10.59
153.0	9.91	.5	10.14	160.0	10.37	.5	10.60
.1	9.92	.6	10.15	.1	10.37	.6	10.60
.2	9.93	.7	10.15	.2	10.38	.7	10.61
.3	9.93	.8	10.16	.3	10.39	.8	10.61
.4	9.94	.9	10.17	.4	10.39	.9	10.62
.5	9.95	157.0	10.17	.5	10.40	164.0	10.63

Decimal Grains to Grams

13

164.1—178.0

10.63—11.53

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
164.1	10.63	167.6	10.86	171.1	11.09	174.6	11.31
.2	10.64	.7	10.87	.2	11.09	.7	11.32
.3	10.65	.8	10.87	.3	11.10	.8	11.33
.4	10.65	.9	10.88	.4	11.11	.9	11.33
.5	10.66	168.0	10.89	.5	11.11	175.0	11.34
.6	10.67	.1	10.89	.6	11.12	.1	11.35
.7	10.67	.2	10.90	.7	11.13	.2	11.35
.8	10.68	.3	10.91	.8	11.13	.3	11.36
.9	10.69	.4	10.91	.9	11.14	.4	11.37
165.0	10.69	.5	10.92	172.0	11.15	.5	11.37
.1	10.70	.6	10.93	.1	11.15	.6	11.38
.2	10.71	.7	10.93	.2	11.16	.7	11.39
.3	10.71	.8	10.94	.3	11.17	.8	11.39
.4	10.72	.9	10.95	.4	11.17	.9	11.40
.5	10.72	169.0	10.95	.5	11.18	176.0	11.41
.6	10.73	.1	10.96	.6	11.18	.1	11.41
.7	10.74	.2	10.96	.7	11.19	.2	11.42
.8	10.74	.3	10.97	.8	11.20	.3	11.42
.9	10.75	.4	10.98	.9	11.20	.4	11.43
166.0	10.76	.5	10.98	173.0	11.21	.5	11.44
.1	10.76	.6	10.99	.1	11.22	.6	11.44
.2	10.77	.7	11.00	.2	11.22	.7	11.45
.3	10.78	.8	11.00	.3	11.23	.8	11.46
.4	10.78	.9	11.01	.4	11.24	.9	11.46
.5	10.79	170.0	11.02	.5	11.24	177.0	11.47
.6	10.80	.1	11.02	.6	11.25	.1	11.48
.7	10.80	.2	11.03	.7	11.26	.2	11.48
.8	10.81	.3	11.04	.8	11.26	.3	11.49
.9	10.82	.4	11.04	.9	11.27	.4	11.50
167.0	10.82	.5	11.05	174.0	11.28	.5	11.50
.1	10.83	.6	11.06	.1	11.28	.6	11.51
.2	10.83	.7	11.06	.2	11.29	.7	11.52
.3	10.84	.8	11.07	.3	11.30	.8	11.52
.4	10.85	.9	11.07	.4	11.30	.9	11.53
.5	10.85	171.0	11.08	.5	11.31	178.0	11.53

178.1—192.0

11.54—12.44

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
178.1	11.54	181.6	11.77	185.1	11.99	188.6	12.22
.2	11.55	.7	11.77	.2	12.00	.7	12.23
.3	11.55	.8	11.78	.3	12.01	.8	12.23
.4	11.56	.9	11.79	.4	12.01	.9	12.24
.5	11.57	182.0	11.79	.5	12.02	189.0	12.25
.6	11.57	.1	11.80	.6	12.03	.1	12.25
.7	11.58	.2	11.81	.7	12.03	.2	12.26
.8	11.59	.3	11.81	.8	12.04	.3	12.27
.9	11.59	.4	11.82	.9	12.05	.4	12.27
179.0	11.60	.5	11.83	186.0	12.05	.5	12.28
.1	11.61	.6	11.83	.1	12.06	.6	12.29
.2	11.61	.7	11.84	.2	12.07	.7	12.29
.3	11.62	.8	11.85	.3	12.07	.8	12.30
.4	11.63	.9	11.85	.4	12.08	.9	12.31
.5	11.63	183.0	11.86	.5	12.09	190.0	12.31
.6	11.64	.1	11.87	.6	12.09	.1	12.32
.7	11.64	.2	11.87	.7	12.10	.2	12.33
.8	11.65	.3	11.88	.8	12.10	.3	12.33
.9	11.66	.4	11.88	.9	12.11	.4	12.34
180.0	11.66	.5	11.89	187.0	12.12	.5	12.34
.1	11.67	.6	11.90	.1	12.12	.6	12.35
.2	11.68	.7	11.90	.2	12.13	.7	12.36
.3	11.68	.8	11.91	.3	12.14	.8	12.36
.4	11.69	.9	11.92	.4	12.14	.9	12.37
.5	11.70	184.0	11.92	.5	12.15	191.0	12.38
.6	11.70	.1	11.93	.6	12.16	.1	12.38
.7	11.71	.2	11.94	.7	12.16	.2	12.39
.8	11.72	.3	11.94	.8	12.17	.3	12.40
.9	11.72	.4	11.95	.9	12.18	.4	12.40
181.0	11.73	.5	11.96	188.0	12.18	.5	12.41
.1	11.74	.6	11.96	.1	12.19	.6	12.42
.2	11.74	.7	11.97	.2	12.20	.7	12.42
.3	11.75	.8	11.98	.3	12.20	.8	12.43
.4	11.76	.9	11.98	.4	12.21	.9	12.44
.5	11.76	185.0	11.99	.5	12.22	192.0	12.44

Decimal Grains to Grams

15

192.1—206.0

12.45—13.35

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
192.1	12.45	195.6	12.68	199.1	12.90	202.6	13.13
.2	12.45	.7	12.68	.2	12.91	.7	13.14
.3	12.46	.8	12.69	.3	12.91	.8	13.14
.4	12.47	.9	12.69	.4	12.92	.9	13.15
.5	12.47	196.0	12.70	.5	12.93	203.0	13.15
.6	12.48	.1	12.71	.6	12.93	.1	13.16
.7	12.49	.2	12.71	.7	12.94	.2	13.17
.8	12.49	.3	12.72	.8	12.95	.3	13.17
.9	12.50	.4	12.73	.9	12.95	.4	13.18
193.0	12.51	.5	12.73	200.0	12.96	.5	13.19
.1	12.51	.6	12.74	.1	12.97	.6	13.19
.2	12.52	.7	12.75	.2	12.97	.7	13.20
.3	12.53	.8	12.75	.3	12.98	.8	13.21
.4	12.53	.9	12.76	.4	12.99	.9	13.21
.5	12.54	197.0	12.77	.5	12.99	204.0	13.22
.6	12.55	.1	12.77	.6	13.00	.1	13.23
.7	12.55	.2	12.78	.7	13.01	.2	13.23
.8	12.56	.3	12.79	.8	13.01	.3	13.24
.9	12.57	.4	12.79	.9	13.02	.4	13.25
194.0	12.57	.5	12.80	201.0	13.03	.5	13.25
.1	12.58	.6	12.80	.1	13.03	.6	13.26
.2	12.58	.7	12.81	.2	13.04	.7	13.26
.3	12.59	.8	12.82	.3	13.04	.8	13.27
.4	12.60	.9	12.82	.4	13.05	.9	13.28
.5	12.60	198.0	12.83	.5	13.06	205.0	13.28
.6	12.61	.1	12.84	.6	13.06	.1	13.29
.7	12.62	.2	12.84	.7	13.07	.2	13.30
.8	12.62	.3	12.85	.8	13.08	.3	13.30
.9	12.63	.4	12.86	.9	13.08	.4	13.31
195.0	12.64	.5	12.86	202.0	13.09	.5	13.32
.1	12.64	.6	12.87	.1	13.10	.6	13.32
.2	12.65	.7	12.88	.2	13.10	.7	13.33
.3	12.66	.8	12.88	.3	13.11	.8	13.34
.4	12.66	.9	12.89	.4	13.12	.9	13.34
.5	12.67	199.0	12.90	.5	13.12	206.0	13.35

206.1—220.0

13.36—14.26

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
206.1	13.36	209.6	13.58	213.1	13.81	216.6	14.04
.2	13.36	.7	13.59	.2	13.82	.7	14.04
.3	13.37	.8	13.60	.3	13.82	.8	14.05
.4	13.38	.9	13.60	.4	13.83	.9	14.06
.5	13.38	210.0	13.61	.5	13.84	217.0	14.06
.6	13.39	.1	13.61	.6	13.84	.1	14.07
.7	13.39	.2	13.62	.7	13.85	.2	14.07
.8	13.40	.3	13.63	.8	13.85	.3	14.08
.9	13.41	.4	13.63	.9	13.86	.4	14.09
207.0	13.41	.5	13.64	214.0	13.87	.5	14.09
.1	13.42	.6	12.65	.1	13.87	.6	14.10
.2	13.43	.7	13.65	.2	13.88	.7	14.11
.3	13.43	.8	13.66	.3	13.89	.8	14.11
.4	13.44	.9	13.67	.4	13.89	.9	14.12
.5	13.45	211.0	13.67	.5	13.90	218.0	14.13
.6	13.45	.1	13.68	.6	13.91	.1	14.13
.7	13.46	.2	13.69	.7	13.91	.2	14.14
.8	13.47	.3	13.69	.8	13.92	.3	14.15
.9	13.47	.4	13.70	.9	13.93	.4	14.15
208.0	13.48	.5	13.71	215.0	13.93	.5	14.16
.1	13.49	.6	13.71	.1	13.94	.6	14.17
.2	13.49	.7	13.72	.2	13.95	.7	14.17
.3	13.50	.8	13.72	.3	13.95	.8	14.18
.4	13.50	.9	13.73	.4	13.96	.9	14.19
.5	13.51	212.0	13.74	.5	13.96	219.0	14.19
.6	13.52	.1	13.74	.6	13.97	.1	14.20
.7	13.52	.2	13.75	.7	13.98	.2	14.20
.8	13.53	.3	13.76	.8	13.98	.3	14.21
.9	13.54	.4	13.76	.9	13.99	.4	14.22
209.0	13.54	.5	13.77	216.0	14.00	.5	14.22
.1	13.55	.6	13.78	.1	14.00	.6	14.23
.2	13.56	.7	13.78	.2	14.01	.7	14.24
.3	13.56	.8	13.79	.3	14.02	.8	14.24
.4	13.57	.9	13.80	.4	14.02	.9	14.25
.5	13.58	213.0	13.80	.5	14.03	220.0	14.26

Decimal Grains to Grams

17

220.1—234.0

14.26—15.16

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
220.1	14.26	223.6	14.49	227.1	14.72	230.6	14.94
.2	14.27	.7	14.50	.2	14.72	.7	14.95
.3	14.28	.8	14.50	.3	14.73	.8	14.96
.4	14.28	.9	14.51	.4	14.74	.9	14.96
.5	14.29	224.0	14.52	.5	14.74	231.0	14.97
.6	14.30	.1	14.52	.6	14.75	.1	14.98
.7	14.30	.2	14.53	.7	14.76	.2	14.98
.8	14.31	.3	14.53	.8	14.76	.3	14.99
.9	14.31	.4	14.54	.9	14.77	.4	15.00
221.0	14.32	.5	14.55	228.0	14.77	.5	15.00
.1	14.33	.6	14.55	.1	14.78	.6	15.01
.2	14.33	.7	14.56	.2	14.79	.7	15.01
.3	14.34	.8	14.57	.3	14.79	.8	15.02
.4	14.35	.9	14.57	.4	14.80	.9	15.03
.5	14.35	225.0	14.58	.5	14.81	232.0	15.03
.6	14.36	.1	14.59	.6	14.81	.1	15.04
.7	14.37	.2	14.59	.7	14.82	.2	15.05
.8	14.37	.3	14.60	.8	14.83	.3	15.05
.9	14.38	.4	14.61	.9	14.83	.4	15.06
222.0	14.39	.5	14.61	229.0	14.84	.5	15.07
.1	14.39	.6	14.62	.1	14.85	.6	15.07
.2	14.40	.7	14.63	.2	14.85	.7	15.08
.3	14.41	.8	14.63	.3	14.86	.8	15.09
.4	14.41	.9	14.64	.4	14.87	.9	15.09
.5	14.42	226.0	14.65	.5	14.87	233.0	15.10
.6	14.42	.1	14.65	.6	14.88	.1	15.11
.7	14.43	.2	14.66	.7	14.88	.2	15.11
.8	14.44	.3	14.66	.8	14.89	.3	15.12
.9	14.44	.4	14.67	.9	14.90	.4	15.12
223.0	14.45	.5	14.68	230.0	14.90	.5	15.13
.1	14.46	.6	14.68	.1	14.91	.6	15.14
.2	14.46	.7	14.69	.2	14.92	.7	15.14
.3	14.47	.8	14.70	.3	14.92	.8	15.15
.4	14.48	.9	14.70	.4	14.93	.9	15.16
.5	14.48	227.0	14.71	.5	14.94	234.0	15.16

234.1—248.0

15.17—16.07

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
234.1	15.17	237.6	15.40	241.1	15.62	244.6	15.85
.2	15.18	.7	15.40	.2	15.63	.7	15.86
.3	15.18	.8	15.41	.3	15.64	.8	15.86
.4	15.19	.9	15.42	.4	15.64	.9	15.87
.5	15.20	238.0	15.42	.5	15.65	145.0	15.88
.6	15.20	.1	15.43	.6	15.66	.1	15.88
.7	15.21	.2	15.44	.7	15.66	.2	15.89
.8	15.22	.3	15.44	.8	15.67	.3	15.90
.9	15.22	.4	15.45	.9	15.68	.4	15.90
235.0	15.23	.5	15.46	242.0	15.68	.5	15.91
.1	15.23	.6	15.46	.1	15.69	.6	15.92
.2	15.24	.7	15.47	.2	15.69	.7	15.92
.3	15.25	.8	15.47	.3	15.70	.8	15.93
.4	15.25	.9	15.48	.4	15.71	.9	15.93
.5	15.26	239.0	15.49	.5	15.71	246.0	15.94
.6	15.27	.1	15.49	.6	15.72	.1	15.95
.7	15.27	.2	15.50	.7	15.73	.2	15.95
.8	15.28	.3	15.51	.8	15.73	.3	15.96
.9	15.29	.4	15.51	.9	15.74	.4	15.97
236.0	15.29	.5	15.52	243.0	15.75	.5	15.97
.1	15.30	.6	15.53	.1	15.75	.6	15.98
.2	15.31	.7	15.53	.2	15.76	.7	15.99
.3	15.31	.8	15.54	.3	15.77	.8	15.99
.4	15.32	.9	15.55	.4	15.77	.9	16.00
.5	15.33	240.0	15.55	.5	15.78	247.0	16.01
.6	15.33	.1	15.56	.6	15.79	.1	16.01
.7	15.34	.2	15.57	.7	15.79	.2	16.02
.8	15.34	.3	15.57	.8	15.80	.3	16.03
.9	15.35	.4	15.58	.9	15.81	.4	16.03
237.0	15.36	.5	15.58	244.0	15.81	.5	16.04
.1	15.36	.6	15.59	.1	15.82	.6	16.04
.2	15.37	.7	15.60	.2	15.82	.7	16.05
.3	15.38	.8	15.60	.3	15.83	.8	16.06
.4	15.38	.9	15.61	.4	15.84	.9	16.06
.5	15.39	241.0	15.62	.5	15.84	248.0	16.07

Decimal Grains to Grams

19

248.1—262.0

16.08—16.98

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
248.1	16.08	251.6	16.30	255.1	16.53	258.6	16.76
.2	16.08	.7	16.31	.2	16.54	.7	16.76
.3	16.09	.8	16.32	.3	16.54	.8	16.77
.4	16.10	.9	16.32	.4	16.55	.9	16.78
.5	16.10	252.0	16.33	.5	16.56	259.0	16.78
.6	16.11	.1	16.34	.6	16.56	.1	16.79
.7	16.12	.2	16.34	.7	16.57	.2	16.80
.8	16.12	.3	16.35	.8	16.58	.3	16.80
.9	16.13	.4	16.36	.9	16.58	.4	16.81
249.0	16.14	.5	16.36	256.0	16.59	.5	16.82
.1	16.14	.6	16.37	.1	16.60	.6	16.82
.2	16.15	.7	16.38	.2	16.60	.7	16.83
.3	16.15	.8	16.38	.3	16.61	.8	16.84
.4	16.16	.9	16.39	.4	16.61	.9	16.84
.5	16.17	253.0	16.39	.5	16.62	260.0	16.85
.6	16.17	.1	16.40	.6	16.63	.1	16.85
.7	16.18	.2	16.41	.7	16.63	.2	16.86
.8	16.19	.3	16.41	.8	16.64	.3	16.87
.9	16.19	.4	16.42	.9	16.65	.4	16.87
250.0	16.20	.5	16.43	257.0	16.65	.5	16.88
.1	16.21	.6	16.43	.1	16.66	.6	16.89
.2	16.21	.7	16.44	.2	16.67	.7	16.89
.3	16.22	.8	16.45	.3	16.67	.8	16.90
.4	16.23	.9	16.45	.4	16.68	.9	16.91
.5	16.23	254.0	16.46	.5	16.69	261.0	16.91
.6	16.24	.1	16.47	.6	16.69	.1	16.92
.7	16.25	.2	16.47	.7	16.70	.2	16.93
.8	16.25	.3	16.48	.8	16.71	.3	16.93
.9	16.26	.4	16.49	.9	16.71	.4	16.94
251.0	16.27	.5	16.49	258.0	16.72	.5	16.95
.1	16.27	.6	16.50	.1	16.73	.6	16.95
.2	16.28	.7	16.50	.2	16.73	.7	16.96
.3	16.28	.8	16.51	.3	16.74	.8	16.96
.4	16.29	.9	16.52	.4	16.74	.9	16.97
.5	16.30	255.0	16.52	.5	16.75	262.0	16.98



262.1—276.0

16.98—17.89

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
262.1	16.98	265.6	17.21	269.1	17.44	272.6	17.66
.2	16.99	.7	17.22	.2	17.44	.7	17.67
.3	17.00	.8	17.22	.3	17.45	.8	17.68
.4	17.00	.9	17.23	.4	17.46	.9	17.68
.5	17.01	266.0	17.24	.5	17.46	273.0	17.69
.6	17.02	.1	17.24	.6	17.47	.1	17.70
.7	17.02	.2	17.25	.7	17.48	.2	17.70
.8	17.03	.3	17.26	.8	17.48	.3	17.71
.9	17.04	.4	17.26	.9	17.49	.4	17.72
263.0	17.04	.5	17.27	270.0	17.50	.5	17.72
.1	17.05	.6	17.28	.1	17.50	.6	17.73
.2	17.06	.7	17.28	.2	17.51	.7	17.74
.3	17.06	.8	17.29	.3	17.52	.8	17.74
.4	17.07	.9	17.30	.4	17.52	.9	17.75
.5	17.08	267.0	17.30	.5	17.53	274.0	17.76
.6	17.08	.1	17.31	.6	17.54	.1	17.76
.7	17.09	.2	17.31	.7	17.54	.2	17.77
.8	17.09	.3	17.32	.8	17.55	.3	17.77
.9	17.10	.4	17.33	.9	17.55	.4	17.78
264.0	17.11	.5	17.33	271.0	17.56	.5	17.79
.1	17.11	.6	17.34	.1	17.57	.6	17.79
.2	17.12	.7	17.35	.2	17.57	.7	17.80
.3	17.13	.8	17.35	.3	17.58	.8	17.81
.4	17.13	.9	17.36	.4	17.59	.9	17.81
.5	17.14	268.0	17.37	.5	17.59	275.0	17.82
.6	17.15	.1	17.37	.6	17.60	.1	17.83
.7	17.15	.2	17.38	.7	17.61	.2	17.83
.8	17.16	.3	17.39	.8	17.61	.3	17.84
.9	17.17	.4	17.39	.9	17.62	.4	17.85
265.0	17.17	.5	17.40	272.0	17.63	.5	17.85
.1	17.18	.6	17.41	.1	17.63	.6	17.86
.2	17.19	.7	17.41	.2	17.64	.7	17.87
.3	17.19	.8	17.42	.3	17.65	.8	17.87
.4	17.20	.9	17.43	.4	17.65	.9	17.88
.5	17.20	269.0	17.43	.5	17.66	276.0	17.89

*Decimal Grains to Grams*

21

276.1—290.0

17.89—18.79

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
276.1	17.89	279.6	18.12	283.1	18.35	286.6	18.57
.2	17.90	.7	18.12	.2	18.35	.7	18.58
.3	17.90	.8	18.13	.3	18.36	.8	18.58
.4	17.91	.9	18.14	.4	18.36	.9	18.59
.5	17.92	280.0	18.14	.5	18.37	287.0	18.60
.6	17.92	.1	18.15	.6	18.38	.1	18.60
.7	17.93	.2	18.16	.7	18.38	.2	18.61
.8	17.94	.3	18.16	.8	18.39	.3	18.62
.9	17.94	.4	18.17	.9	18.40	.4	18.62
277.0	17.95	.5	18.18	284.0	18.40	.5	18.63
.1	17.96	.6	18.18	.1	18.41	.6	18.64
.2	17.96	.7	18.19	.2	18.42	.7	18.64
.3	17.97	.8	18.20	.3	18.42	.8	18.65
.4	17.98	.9	18.20	.4	18.43	.9	18.66
.5	17.98	281.0	18.21	.5	18.44	288.0	18.66
.6	17.99	.1	18.22	.6	18.44	.1	18.67
.7	18.00	.2	18.22	.7	18.45	.2	18.68
.8	18.00	.3	18.23	.8	18.46	.3	18.68
.9	18.01	.4	18.23	.9	18.46	.4	18.69
278.0	18.01	.5	18.24	285.0	18.47	.5	18.70
.1	18.02	.6	18.25	.1	18.47	.6	18.70
.2	18.03	.7	18.25	.2	18.48	.7	18.71
.3	18.03	.8	18.26	.3	18.49	.8	18.71
.4	18.04	.9	18.27	.4	18.49	.9	18.72
.5	18.05	282.0	18.27	.5	18.50	289.0	18.73
.6	18.05	.1	18.28	.6	18.51	.1	18.73
.7	18.06	.2	18.29	.7	18.51	.2	18.74
.8	18.07	.3	18.29	.8	18.52	.3	18.75
.9	18.07	.4	18.30	.9	18.53	.4	18.75
279.0	18.08	.5	18.31	286.0	18.53	.5	18.76
.1	18.09	.6	18.31	.1	18.54	.6	18.77
.2	18.09	.7	18.32	.2	18.55	.7	18.77
.3	18.10	.8	18.33	.3	18.55	.8	18.78
.4	18.11	.9	18.33	.4	18.56	.9	18.79
.5	18.11	283.0	18.34	.5	18.57	290.0	18.79

290.1—304.0

18.80—19.70

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
290.1	18.80	293.6	19.03	297.1	19.25	300.6	19.48
.2	18.81	.7	19.03	.2	19.26	.7	19.49
.3	18.81	.8	19.04	.3	19.27	.8	19.49
.4	18.82	.9	19.04	.4	19.27	.9	19.50
.5	18.82	294.0	19.05	.5	19.28	301.0	19.51
.6	18.83	.1	19.06	.6	19.28	.1	19.51
.7	18.84	.2	19.06	.7	19.29	.2	19.52
.8	18.84	.3	19.07	.8	19.30	.3	19.52
.9	18.85	.4	19.08	.9	19.30	.4	19.53
291.0	18.86	.5	19.08	298.0	19.31	.5	19.54
.1	18.86	.6	19.09	.1	19.32	.6	19.54
.2	18.87	.7	19.10	.2	19.32	.7	19.55
.3	18.88	.8	19.10	.3	19.33	.8	19.56
.4	18.88	.9	19.11	.4	19.34	.9	19.56
.5	18.89	295.0	19.12	.5	19.34	302.0	19.57
.6	18.90	.1	19.12	.6	19.35	.1	19.58
.7	18.90	.2	19.13	.7	19.36	.2	19.58
.8	18.91	.3	19.14	.8	19.36	.3	19.59
.9	18.92	.4	19.14	.9	19.37	.4	19.60
292.0	18.92	.5	19.15	299.0	19.38	.5	19.60
.1	18.93	.6	19.16	.1	19.38	.6	19.61
.2	18.93	.7	19.16	.2	19.39	.7	19.62
.3	18.94	.8	19.17	.3	19.39	.8	19.62
.4	18.95	.9	19.17	.4	19.40	.9	19.63
.5	18.95	296.0	19.18	.5	19.41	303.0	19.63
.6	18.96	.1	19.19	.6	19.41	.1	19.64
.7	18.97	.2	19.19	.7	19.42	.2	19.65
.8	18.97	.3	19.20	.8	19.43	.3	19.65
.9	18.98	.4	19.21	.9	19.43	.4	19.66
293.0	18.99	.5	19.21	300.0	19.44	.5	19.67
.1	18.99	.6	19.22	.1	19.45	.6	19.67
.2	19.00	.7	19.23	.2	19.45	.7	19.68
.3	19.01	.8	19.23	.3	19.46	.8	19.69
.4	19.01	.9	19.24	.4	19.47	.9	19.69
.5	19.02	297.0	19.25	.5	19.47	304.0	19.70

Decimal Grains to Grams

23

304.1—318.0

19.71—20.61

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
304.1	19.71	307.6	19.93	311.1	20.16	314.6	20.39
.2	19.71	.7	19.94	.2	20.17	.7	20.39
.3	19.72	.8	19.95	.3	20.17	.8	20.40
.4	19.73	.9	19.95	.4	20.18	.9	20.41
.5	19.73	308.0	19.96	.5	20.19	315.0	20.41
.6	19.74	.1	19.97	.6	20.19	.1	20.42
.7	19.74	.2	19.97	.7	20.20	.2	20.43
.8	19.75	.3	19.98	.8	20.20	.3	20.43
.9	19.76	.4	19.98	.9	20.21	.4	20.44
305.0	19.76	.5	19.99	312.0	20.22	.5	20.44
.1	19.77	.6	20.00	.1	20.22	.6	20.45
.2	19.78	.7	20.00	.2	20.23	.7	20.46
.3	19.78	.8	20.01	.3	20.24	.8	20.46
.4	19.79	.9	20.02	.4	20.24	.9	20.47
.5	19.80	309.0	20.02	.5	20.25	316.0	20.48
.6	19.80	.1	20.03	.6	20.26	.1	20.48
.7	19.81	.2	20.04	.7	20.26	.2	20.49
.8	19.82	.3	20.04	.8	20.27	.3	20.50
.9	19.82	.4	20.05	.9	20.28	.4	20.50
306.0	19.83	.5	20.06	313.0	20.28	.5	20.51
.1	19.84	.6	20.06	.1	20.29	.6	20.52
.2	19.84	.7	20.07	.2	20.30	.7	20.52
.3	19.85	.8	20.08	.3	20.30	.8	20.53
.4	19.85	.9	20.08	.4	20.31	.9	20.54
.5	19.86	310.0	20.09	.5	20.32	317.0	20.54
.6	19.87	.1	20.09	.6	20.32	.1	20.55
.7	19.87	.2	20.10	.7	20.33	.2	20.55
.8	19.88	.3	20.11	.8	20.33	.3	20.56
.9	19.89	.4	20.11	.9	20.34	.4	20.57
307.0	19.89	.5	20.12	314.0	20.35	.5	20.57
.1	19.90	.6	20.13	.1	20.35	.6	20.58
.2	19.91	.7	20.13	.2	20.36	.7	20.59
.3	19.91	.8	20.14	.3	20.37	.8	20.59
.4	19.92	.9	20.15	.4	20.37	.9	20.60
.5	19.93	311.0	20.15	.5	20.38	318.0	20.61

318.1—332.0

20.61—21.51

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
318.1	20.61	321.6	20.84	325.1	21.07	328.6	21.29
.2	20.62	.7	20.85	.2	21.07	.7	21.30
.3	20.63	.8	20.85	.3	21.08	.8	21.31
.4	20.63	.9	20.86	.4	21.09	.9	21.31
.5	20.64	322.0	20.87	.5	21.09	329.0	21.32
.6	20.65	.1	20.87	.6	21.10	.1	21.33
.7	20.65	.2	20.88	.7	21.11	.2	21.33
.8	20.66	.3	20.89	.8	21.11	.3	21.34
.9	20.66	.4	20.89	.9	21.12	.4	21.35
319.0	20.67	.5	20.90	326.0	21.13	.5	21.35
.1	20.68	.6	20.90	.1	21.13	.6	21.36
.2	20.68	.7	20.91	.2	21.14	.7	21.36
.3	20.69	.8	20.92	.3	21.14	.8	21.37
.4	20.70	.9	20.92	.4	21.15	.9	21.38
.5	20.70	323.0	20.93	.5	21.16	330.0	21.38
.6	20.71	.1	20.94	.6	21.16	.1	21.39
.7	20.72	.2	20.94	.7	21.17	.2	21.40
.8	20.72	.3	20.95	.8	21.18	.3	21.40
.9	20.73	.4	20.96	.9	21.18	.4	21.41
320.0	20.74	.5	20.96	327.0	21.19	.5	21.42
.1	20.74	.6	20.97	.1	21.20	.6	21.42
.2	20.75	.7	20.98	.2	21.20	.7	21.43
.3	20.76	.8	20.98	.3	21.21	.8	21.44
.4	20.76	.9	20.99	.4	21.22	.9	21.44
.5	20.77	324.0	21.00	.5	21.22	331.0	21.45
.6	20.78	.1	21.00	.6	21.23	.1	21.46
.7	20.78	.2	21.01	.7	21.24	.2	21.46
.8	20.79	.3	21.01	.8	21.24	.3	21.47
.9	20.79	.4	21.02	.9	21.25	.4	21.47
321.0	20.80	.5	21.03	328.0	21.25	.5	21.48
.1	20.81	.6	21.03	.1	21.26	.6	21.49
.2	20.81	.7	21.04	.2	21.27	.7	21.49
.3	20.82	.8	21.05	.3	21.27	.8	21.50
.4	20.83	.9	21.05	.4	21.28	.9	21.51
.5	20.83	325.0	21.06	.5	21.29	332.0	21.51

Decimal Grains to Grams

25

332.1—346.0

21.52—22.42

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
332.1	21.52	335.6	21.75	339.1	21.97	342.6	22.20
.2	21.53	.7	21.75	.2	21.98	.7	22.21
.3	21.53	.8	21.76	.3	21.99	.8	22.21
.4	21.54	.9	21.77	.4	21.99	.9	22.22
.5	21.55	336.0	21.77	.5	22.00	343.0	22.23
.6	21.55	.1	21.78	.6	22.01	.1	22.23
.7	21.56	.2	21.79	.7	22.01	.2	22.24
.8	21.57	.3	21.79	.8	22.02	.3	22.25
.9	21.57	.4	21.80	.9	22.03	.4	22.25
333.0	21.58	.5	21.81	340.0	22.03	.5	22.26
.1	21.59	.6	21.81	.1	22.04	.6	22.27
.2	21.59	.7	21.82	.2	22.05	.7	22.27
.3	21.60	.8	21.82	.3	22.05	.8	22.28
.4	21.60	.9	21.83	.4	22.06	.9	22.28
.5	21.61	337.0	21.84	.5	22.06	344.0	22.29
.6	21.62	.1	21.84	.6	22.07	.1	22.30
.7	21.62	.2	21.85	.7	22.08	.2	22.30
.8	21.63	.3	21.86	.8	22.08	.3	22.31
.9	21.64	.4	21.86	.9	22.09	.4	22.32
334.0	21.64	.5	21.87	341.0	22.10	.5	22.32
.1	21.65	.6	21.88	.1	22.10	.6	22.33
.2	21.66	.7	21.88	.2	22.11	.7	22.34
.3	21.66	.8	21.89	.3	22.12	.8	22.34
.4	21.67	.9	21.90	.4	22.12	.9	22.35
.5	21.68	338.0	21.90	.5	22.13	345.0	22.36
.6	21.68	.1	21.91	.6	22.14	.1	22.36
.7	21.69	.2	21.92	.7	22.14	.2	22.37
.8	21.70	.3	21.92	.8	22.15	.3	22.38
.9	21.70	.4	21.93	.9	22.16	.4	22.38
335.0	21.71	.5	21.94	342.0	22.16	.5	22.39
.1	21.71	.6	21.94	.1	22.17	.6	22.40
.2	21.72	.7	21.95	.2	22.17	.7	22.40
.3	21.73	.8	21.95	.3	22.18	.8	22.41
.4	21.73	.9	21.96	.4	22.19	.9	22.41
.5	21.74	339.0	21.97	.5	22.19	346.0	22.42

346.1—360.0

22.43—23.33

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
346.1	22.43	349.6	22.65	353.1	22.88	356.6	23.11
.2	22.43	.7	22.66	.2	22.89	.7	23.11
.3	22.44	.8	22.67	.3	22.89	.8	23.12
.4	22.45	.9	22.67	.4	22.90	.9	23.13
.5	22.45	350.0	22.68	.5	22.91	357.0	23.13
.6	22.46	.1	22.69	.6	22.91	.1	23.14
.7	22.47	.2	22.69	.7	22.92	.2	23.15
.8	22.47	.3	22.70	.8	22.93	.3	23.15
.9	22.48	.4	22.71	.9	22.93	.4	23.16
347.0	22.49	.5	22.71	354.0	22.94	.5	23.17
.1	22.49	.6	22.72	.1	22.95	.6	23.17
.2	22.50	.7	22.73	.2	22.95	.7	23.18
.3	22.51	.8	22.73	.3	22.96	.8	23.19
.4	22.51	.9	22.74	.4	22.97	.9	23.19
.5	22.52	351.0	22.75	.5	22.97	358.0	23.20
.6	22.52	.1	22.75	.6	22.98	.1	23.21
.7	22.53	.2	22.76	.7	22.98	.2	23.21
.8	22.54	.3	22.76	.8	22.99	.3	23.22
.9	22.54	.4	22.77	.9	23.00	.4	23.22
248.0	22.55	.5	22.78	355.0	23.00	.5	23.23
.1	22.56	.6	22.78	.1	23.01	.6	23.24
.2	22.56	.7	22.79	.2	23.02	.7	23.24
.3	22.57	.8	22.80	.3	23.02	.8	23.25
.4	22.58	.9	22.80	.4	23.03	.9	23.26
.5	22.58	352.0	22.81	.5	23.04	359.0	23.26
.6	22.59	.1	22.82	.6	23.04	.1	23.27
.7	22.60	.2	22.82	.7	23.05	.2	23.28
.8	22.60	.3	22.83	.8	23.06	.3	23.28
.9	22.61	.4	22.84	.9	23.06	.4	23.29
349.0	22.62	.5	22.84	356.0	23.07	.5	23.30
.1	22.62	.6	22.85	.1	23.08	.6	23.30
.2	22.63	.7	22.86	.2	23.08	.7	23.31
.3	22.63	.8	22.86	.3	23.09	.8	23.32
.4	22.64	.9	22.87	.4	23.09	.9	23.32
.5	22.65	353.0	22.87	.5	23.10	360.0	23.33

Decimal Grains to Grams

27

360.1—374.0

23.33—24.24

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
360.1	23.33	363.6	23.56	367.1	23.79	370.6	24.02
.2	23.34	.7	23.57	.2	23.79	.7	24.02
.3	23.35	.8	23.57	.3	23.80	.8	24.03
.4	23.35	.9	23.58	.4	23.81	.9	24.03
.5	23.36	364.0	23.59	.5	23.81	371.0	24.04
.6	23.37	.1	23.59	.6	23.82	.1	24.05
.7	23.37	.2	23.60	.7	23.83	.2	24.05
.8	23.38	.3	23.61	.8	23.83	.3	24.06
.9	23.39	.4	23.61	.9	23.84	.4	24.07
361.0	23.39	.5	23.62	368.0	23.85	.5	24.07
.1	23.40	.6	23.63	.1	23.85	.6	24.08
.2	23.41	.7	23.63	.2	23.86	.7	24.09
.3	23.41	.8	23.64	.3	23.87	.8	24.09
.4	23.42	.9	23.65	.4	23.87	.9	24.10
.5	23.43	365.0	23.65	.5	23.88	372.0	24.11
.6	23.43	.1	23.66	.6	23.89	.1	24.11
.7	23.44	.2	23.67	.7	23.89	.2	24.12
.8	23.44	.3	23.67	.8	23.90	.3	24.13
.9	23.45	.4	23.68	.9	23.90	.4	24.13
362.0	23.46	.5	23.68	369.0	23.91	.5	24.14
.1	23.46	.6	23.69	.1	23.92	.6	24.14
.2	23.47	.7	23.70	.2	23.92	.7	24.15
.3	23.48	.8	23.70	.3	23.93	.8	24.16
.4	23.48	.9	23.71	.4	23.94	.9	24.16
.5	23.49	366.0	23.72	.5	23.94	373.0	24.17
.6	23.50	.1	23.72	.6	23.95	.1	24.18
.7	23.50	.2	23.73	.7	23.96	.2	24.18
.8	23.51	.3	23.74	.8	23.96	.3	24.19
.9	23.52	.4	23.74	.9	23.97	.4	24.20
363.0	23.52	.5	23.75	370.0	23.98	.5	24.20
.1	23.53	.6	23.76	.1	23.98	.6	24.21
.2	23.54	.7	23.76	.2	23.99	.7	24.22
.3	23.54	.8	23.77	.3	24.00	.8	24.22
.4	23.55	.9	23.78	.4	24.00	.9	24.23
.5	23.55	367.0	23.78	.5	24.01	374.0	24.24



374.1—388.0

24.24—25.14

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
374.1	24.24	377.6	24.47	381.1	24.70	384.6	24.92
.2	24.25	.7	24.48	.2	24.70	.7	24.93
.3	24.25	.8	24.48	.3	24.71	.8	24.94
.4	24.26	.9	24.49	.4	24.71	.9	24.94
.5	24.27	378.0	24.49	.5	24.72	385.0	24.95
.6	24.27	.1	24.50	.6	24.73	.1	24.95
.7	24.28	.2	24.51	.7	24.73	.2	24.96
.8	24.29	.3	24.51	.8	24.74	.3	24.97
.9	24.29	.4	24.52	.9	24.75	.4	24.97
375.0	24.30	.5	24.53	382.0	24.75	.5	24.98
.1	24.31	.6	24.53	.1	24.76	.6	24.99
.2	24.31	.7	24.54	.2	24.77	.7	24.99
.3	24.32	.8	24.55	.3	24.77	.8	25.00
.4	24.33	.9	24.55	.4	24.78	.9	25.01
.5	24.33	379.0	24.56	.5	24.79	386.0	25.01
.6	24.34	.1	24.57	.6	24.79	.1	25.02
.7	24.35	.2	24.57	.7	24.80	.2	25.03
.8	24.35	.3	24.58	.8	24.81	.3	25.03
.9	24.36	.4	24.59	.9	24.81	.4	25.04
376.0	24.36	.5	24.59	383.0	24.82	.5	25.05
.1	24.37	.6	24.60	.1	24.83	.6	25.05
.2	24.38	.7	24.60	.2	24.83	.7	25.06
.3	24.38	.8	24.61	.3	24.84	.8	25.06
.4	24.39	.9	24.62	.4	24.84	.9	25.07
.5	24.40	380.0	24.62	.5	24.85	387.0	25.08
.6	24.40	.1	24.63	.6	24.86	.1	25.08
.7	24.41	.2	24.64	.7	24.86	.2	25.09
.8	24.42	.3	24.64	.8	24.87	.3	25.10
.9	24.42	.4	24.65	.9	24.88	.4	25.10
377.0	24.43	.5	24.66	384.0	24.88	.5	25.11
.1	24.44	.6	24.66	.1	24.89	.6	25.12
.2	24.44	.7	24.67	.2	24.90	.7	25.12
.3	24.45	.8	24.68	.3	24.90	.8	25.13
.4	24.46	.9	24.68	.4	24.91	.9	25.14
.5	24.46	381.0	24.69	.5	24.92	388.0	25.14

Decimal Grains to Grams

29

388.1—402.0

25.15—26.05

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
388.1	25.15	391.6	25.38	395.1	25.60	398.6	25.83
.2	25.16	.7	25.38	.2	25.61	.7	25.84
.3	25.16	.8	25.39	.3	25.62	.8	25.84
.4	25.17	.9	25.40	.4	25.62	.9	25.85
.5	25.17	392.0	25.40	.5	25.63	399.0	25.86
.6	25.18	.1	25.41	.6	25.64	.1	25.86
.7	25.19	.2	25.41	.7	25.64	.2	25.87
.8	25.19	.3	25.42	.8	25.65	.3	25.87
.9	25.20	.4	25.43	.9	25.65	.4	25.88
389.0	25.21	.5	25.43	396.0	25.66	.5	25.89
.1	25.21	.6	25.44	.1	25.67	.6	25.89
.2	25.22	.7	25.45	.2	25.67	.7	25.90
.3	25.23	.8	25.45	.3	25.68	.8	25.91
.4	25.23	.9	25.46	.4	25.69	.9	25.91
.5	25.24	393.0	25.47	.5	25.69	400.0	25.92
.6	25.25	.1	25.47	.6	25.70	.1	25.93
.7	25.25	.2	25.48	.7	25.71	.2	25.93
.8	25.26	.3	25.49	.8	25.71	.3	25.94
.9	25.27	.4	25.49	.9	25.72	.4	25.95
390.0	25.27	.5	25.50	397.0	25.73	.5	25.95
.1	25.28	.6	25.51	.1	25.73	.6	25.96
.2	25.29	.7	25.51	.2	25.74	.7	25.97
.3	25.29	.8	25.52	.3	25.75	.8	25.97
.4	25.30	.9	25.52	.4	25.75	.9	25.98
.5	25.30	394.0	25.53	.5	25.76	401.0	25.98
.6	25.31	.1	25.54	.6	25.76	.1	25.99
.7	25.32	.2	25.54	.7	25.77	.2	26.00
.8	25.32	.3	25.55	.8	25.78	.3	26.00
.9	25.33	.4	25.56	.9	25.78	.4	26.01
391.0	25.34	.5	25.56	398.0	25.79	.5	26.02
.1	25.34	.6	25.57	.1	25.80	.6	26.02
.2	25.35	.7	25.58	.2	25.80	.7	26.03
.3	25.36	.8	25.58	.3	25.81	.8	26.04
.4	25.36	.9	25.59	.4	25.82	.9	26.04
.5	25.37	395.0	25.60	.5	25.82	402.0	26.05

402.1—416.0

26.06—26.96

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
402.1	26.06	405.6	26.28	409.1	26.51	412.6	26.74
.2	26.06	.7	26.29	.2	26.52	.7	26.74
.3	26.07	.8	26.30	.3	26.52	.8	26.75
.4	26.08	.9	26.30	.4	26.53	.9	26.76
.5	26.08	406.0	26.31	.5	26.54	413.0	26.76
.6	26.09	.1	26.32	.6	26.54	.1	26.77
.7	26.10	.2	26.32	.7	26.55	.2	26.78
.8	26.10	.3	26.33	.8	26.56	.3	26.78
.9	26.11	.4	26.33	.9	26.56	.4	26.79
403.0	26.11	.5	26.34	410.0	26.57	.5	26.79
.1	26.12	.6	26.35	.1	26.57	.6	26.80
.2	26.13	.7	26.35	.2	26.58	.7	26.81
.3	26.13	.8	26.36	.3	26.59	.8	26.81
.4	26.14	.9	26.37	.4	26.59	.9	26.82
.5	26.15	407.0	26.37	.5	26.60	414.0	26.83
.6	26.15	.1	26.38	.6	26.61	.1	26.83
.7	26.16	.2	26.39	.7	26.61	.2	26.84
.8	26.17	.3	26.39	.8	26.62	.3	26.85
.9	26.17	.4	26.40	.9	26.63	.4	26.85
404.0	26.18	.5	26.41	411.0	26.63	.5	26.86
.1	26.19	.6	26.41	.1	26.64	.6	26.87
.2	26.19	.7	26.42	.2	26.65	.7	26.87
.3	26.20	.8	26.43	.3	26.65	.8	26.88
.4	26.21	.9	26.43	.4	26.66	.9	26.89
.5	26.21	408.0	26.44	.5	26.67	415.0	26.89
.6	26.22	.1	26.45	.6	26.67	.1	26.90
.7	26.22	.2	26.45	.7	26.68	.2	26.91
.8	26.23	.3	26.46	.8	26.68	.3	26.91
.9	26.24	.4	26.46	.9	26.69	.4	26.92
405.0	26.24	.5	26.47	412.0	26.70	.5	26.92
.1	26.25	.6	26.48	.1	26.70	.6	26.93
.2	26.26	.7	26.48	.2	26.71	.7	26.94
.3	26.26	.8	26.49	.3	26.72	.8	26.94
.4	26.27	.9	26.50	.4	26.72	.9	26.95
.5	26.28	409.0	26.50	.5	26.73	416.0	26.96

Decimal Grains to Grams

31

416.1—430.0

26.96—27.86

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
416.1	26.96	419.6	27.19	423.1	27.42	426.6	27.64
.2	26.97	.7	27.20	.2	27.42	.7	27.65
.3	26.98	.8	27.20	.3	27.43	.8	27.66
.4	26.98	.9	27.21	.4	27.44	.9	27.66
.5	26.99	420.0	27.22	.5	27.44	427.0	27.67
.6	27.00	.1	27.22	.6	27.45	.1	27.68
.7	27.00	.2	27.23	.7	27.46	.2	27.68
.8	27.01	.3	27.24	.8	27.46	.3	27.69
.9	27.02	.4	27.24	.9	27.47	.4	27.70
417.0	27.02	.5	27.25	424.0	27.48	.5	27.70
.1	27.03	.6	27.26	.1	27.48	.6	27.71
.2	27.03	.7	27.26	.2	27.49	.7	27.72
.3	27.04	.8	27.27	.3	27.49	.8	27.72
.4	27.05	.9	27.27	.4	27.50	.9	27.73
.5	27.05	421.0	27.28	.5	27.51	428.0	27.73
.6	27.06	.1	27.29	.6	27.51	.1	27.74
.7	27.07	.2	27.29	.7	27.52	.2	27.75
.8	27.07	.3	27.30	.8	27.53	.3	27.75
.9	27.08	.4	27.31	.9	27.53	.4	27.76
418.0	27.09	.5	27.31	425.0	27.54	.5	27.77
.1	27.09	.6	27.32	.1	27.55	.6	27.77
.2	27.10	.7	27.33	.2	27.55	.7	27.78
.3	27.11	.8	27.33	.3	27.56	.8	27.79
.4	27.11	.9	27.34	.4	27.57	.9	27.79
.5	27.12	422.0	27.35	.5	27.57	429.0	27.80
.6	27.13	.1	27.35	.6	27.58	.1	27.81
.7	27.13	.2	27.36	.7	27.59	.2	27.81
.8	27.14	.3	27.37	.8	27.59	.3	27.82
.9	27.14	.4	27.37	.9	27.60	.4	27.83
419.0	27.15	.5	27.38	426.0	27.60	.5	27.83
.1	27.16	.6	27.38	.1	27.61	.6	27.84
.2	27.16	.7	27.39	.2	27.62	.7	27.84
.3	27.17	.8	27.40	.3	27.62	.8	27.85
.4	27.18	.9	27.40	.4	27.63	.9	27.86
.5	27.18	423.0	27.41	.5	27.64	430.0	27.86

430.1—444.0

27.87—28.77

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
430.1	27.87	433.6	28.10	437.1	28.32	440.6	28.55
.2	27.88	.7	28.10	.2	28.33	.7	28.56
.3	27.88	.8	28.11	.3	28.34	.8	28.56
.4	27.89	.9	28.12	.4	28.34	.9	28.57
.5	27.90	434.0	28.12	.5	28.35	441.0	28.58
.6	27.90	.1	28.13	.6	28.36	.1	28.58
.7	27.91	.2	28.14	.7	28.36	.2	28.59
.8	27.92	.3	28.14	.8	28.37	.3	28.60
.9	27.92	.4	28.15	.9	28.38	.4	28.60
431.0	27.93	.5	28.16	438.0	28.38	.5	28.61
.1	27.94	.6	28.16	.1	28.39	.6	28.62
.2	27.94	.7	28.17	.2	28.40	.7	28.62
.3	27.95	.8	28.18	.3	28.40	.8	28.63
.4	27.95	.9	28.18	.4	28.41	.9	28.64
.5	27.96	435.0	28.19	.5	28.41	442.0	28.64
.6	27.97	.1	28.19	.6	28.42	.1	28.65
.7	27.97	.2	28.20	.7	28.43	.2	28.65
.8	27.98	.3	28.21	.8	28.43	.3	28.66
.9	27.99	.4	28.21	.9	28.44	.4	28.67
432.0	27.99	.5	28.22	439.0	28.45	.5	28.67
.1	28.00	.6	28.23	.1	28.45	.6	28.68
.2	28.01	.7	28.23	.2	28.46	.7	28.69
.3	28.01	.8	28.24	.3	28.47	.8	28.69
.4	28.02	.9	28.25	.4	28.47	.9	28.70
.5	28.03	436.0	28.25	.5	28.48	443.0	28.71
.6	28.03	.1	28.26	.6	28.49	.1	28.71
.7	28.04	.2	28.27	.7	28.49	.2	28.72
.8	28.05	.3	28.27	.8	28.50	.3	28.73
.9	28.05	.4	28.28	.9	28.51	.4	28.73
433.0	28.06	.5	28.29	440.0	28.51	.5	28.74
.1	28.07	.6	28.29	.1	28.52	.6	28.75
.2	28.07	.7	28.30	.2	28.53	.7	28.75
.3	28.08	.8	28.30	.3	28.53	.8	28.76
.4	28.08	.9	28.31	.4	28.54	.9	28.76
.5	28.09	437.0	28.32	.5	28.54	444.0	28.77

*Decimal Grains to Grams*

33

444.1—458.0

28.78—29.68

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
444.1	28.78	447.6	29.00	451.1	29.23	454.6	29.46
.2	28.78	.7	29.01	.2	29.24	.7	29.46
.3	28.79	.8	29.02	.3	29.24	.8	29.47
.4	28.80	.9	29.02	.4	29.25	.9	29.48
.5	28.80	448.0	29.03	.5	29.26	455.0	29.48
.6	28.81	.1	29.04	.6	29.26	.1	29.49
.7	28.82	.2	29.04	.7	29.27	.2	29.50
.8	28.82	.3	29.05	.8	29.28	.3	29.50
.9	28.83	.4	29.06	.9	29.28	.4	29.51
445.0	28.84	.5	29.06	452.0	29.29	.5	29.52
.1	28.84	.6	29.07	.1	29.30	.6	29.52
.2	28.85	.7	29.08	.2	29.30	.7	29.53
.3	28.86	.8	29.08	.3	29.31	.8	29.54
.4	28.86	.9	29.09	.4	29.32	.9	29.54
.5	28.87	449.0	29.10	.5	29.32	456.0	29.55
.6	28.87	.1	29.10	.6	29.33	.1	29.56
.7	28.88	.2	29.11	.7	29.34	.2	29.56
.8	28.89	.3	29.11	.8	29.34	.3	29.57
.9	28.89	.4	29.12	.9	29.35	.4	29.57
446.0	28.90	.5	29.13	453.0	29.35	.5	29.58
.1	28.91	.6	29.13	.1	29.36	.6	29.59
.2	28.91	.7	29.14	.2	29.37	.7	29.59
.3	28.92	.8	29.15	.3	29.37	.8	29.60
.4	28.93	.9	29.15	.4	29.38	.9	29.61
.5	28.93	450.0	29.16	.5	29.39	457.0	29.61
.6	28.94	.1	29.17	.6	29.39	.1	29.62
.7	28.95	.2	29.17	.7	29.40	.2	29.63
.8	28.95	.3	29.18	.8	29.41	.3	29.63
.9	28.96	.4	29.19	.9	29.41	.4	29.64
447.0	28.97	.5	29.19	454.0	29.42	.5	29.65
.1	28.97	.6	29.20	.1	29.43	.6	29.65
.2	28.98	.7	29.21	.2	29.43	.7	29.66
.3	28.99	.8	29.21	.3	29.44	.8	29.67
.4	28.99	.9	29.22	.4	29.45	.9	29.67
.5	29.00	451.0	29.22	.5	29.45	458.0	29.68

458.1—472.0

29.68—30.59

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
458.1	29.68	461.6	29.91	465.1	30.14	468.6	30.37
.2	29.69	.7	29.92	.2	30.15	.7	30.37
.3	29.70	.8	29.92	.3	30.15	.8	30.38
.4	29.70	.9	29.93	.4	30.16	.9	30.38
.5	29.71	462.0	29.94	.5	30.16	469.0	30.39
.6	29.72	.1	29.94	.6	30.17	.1	30.40
.7	29.72	.2	29.95	.7	30.18	.2	30.40
.8	29.73	.3	29.96	.8	30.18	.3	30.41
.9	29.74	.4	29.96	.9	30.19	.4	30.42
459.0	29.74	.5	29.97	466.0	30.20	.5	30.42
.1	29.75	.6	29.98	.1	30.20	.6	30.43
.2	29.76	.7	29.98	.2	30.21	.7	30.44
.3	29.76	.8	29.99	.3	30.22	.8	30.44
.4	29.77	.9	30.00	.4	30.22	.9	30.45
.5	29.78	463.0	30.00	.5	30.23	470.0	30.46
.6	29.78	.1	30.01	.6	30.24	.1	30.46
.7	29.79	.2	30.02	.7	30.24	.2	30.47
.8	29.80	.3	30.02	.8	30.25	.3	30.48
.9	29.80	.4	30.03	.9	30.26	.4	30.48
460.0	29.81	.5	30.03	467.0	30.26	.5	30.49
.1	29.81	.6	30.04	.1	30.27	.6	30.49
.2	29.82	.7	30.05	.2	30.27	.7	30.50
.3	29.83	.8	30.05	.3	30.28	.8	30.51
.4	29.83	.9	30.06	.4	30.29	.9	30.51
.5	29.84	464.0	30.07	.5	30.29	471.0	30.52
.6	29.85	.1	30.07	.6	30.30	.1	30.53
.7	29.85	.2	30.08	.7	30.31	.2	30.53
.8	29.86	.3	30.09	.8	30.31	.3	30.54
.9	29.87	.4	30.09	.9	30.32	.4	30.55
461.0	29.87	.5	30.10	468.0	30.33	.5	30.55
.1	29.88	.6	30.11	.1	30.33	.6	30.56
.2	29.89	.7	30.11	.2	30.34	.7	30.57
.3	29.89	.8	30.12	.3	30.35	.8	30.57
.4	29.90	.9	30.13	.4	30.35	.9	30.58
.5	29.91	465.0	30.13	.5	30.36	472.0	30.59

Decimal Grains to Grams

35

472.1—486.0

30.59—31.49

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
472.1	30.59	475.6	30.82	479.1	31.05	482.6	31.27
.2	30.60	.7	30.83	.2	31.05	.7	31.28
.3	30.61	.8	30.83	.3	31.06	.8	31.29
.4	30.61	.9	30.84	.4	31.07	.9	31.29
.5	30.62	476.0	30.84	.5	31.07	483.0	31.30
.6	30.62	.1	30.85	.6	31.08	.1	31.30
.7	30.63	.2	30.86	.7	31.08	.2	31.31
.8	30.64	.3	30.86	.8	31.09	.3	31.32
.9	30.64	.4	30.87	.9	31.10	.4	31.32
473.0	30.65	.5	30.88	480.0	31.10	.5	31.33
.1	30.66	.6	30.88	.1	31.11	.6	31.34
.2	30.66	.7	30.89	.2	31.12	.7	31.34
.3	30.67	.8	30.90	.3	31.12	.8	31.35
.4	30.68	.9	30.90	.4	31.13	.9	31.36
.5	30.68	477.0	30.91	.5	31.14	484.0	31.36
.6	30.69	.1	30.92	.6	31.14	.1	31.37
.7	30.70	.2	30.92	.7	31.15	.2	31.38
.8	30.70	.3	30.93	.8	31.16	.3	31.38
.9	30.71	.4	30.94	.9	31.16	.4	31.39
474.0	30.72	.5	30.94	481.0	31.17	.5	31.40
.1	30.72	.6	30.95	.1	31.18	.6	31.40
.2	30.73	.7	30.96	.2	31.18	.7	31.41
.3	30.73	.8	30.96	.3	31.19	.8	31.42
.4	30.74	.9	30.97	.4	31.19	.9	31.42
.5	30.75	478.0	30.97	.5	31.20	485.0	31.43
.6	30.75	.1	30.98	.6	31.21	.1	31.43
.7	30.76	.2	30.99	.7	31.21	.2	31.44
.8	30.77	.3	30.99	.8	31.22	.3	31.45
.9	30.77	.4	31.00	.9	31.23	.4	31.45
475.0	30.78	.5	31.01	482.0	31.23	.5	31.46
.1	30.79	.6	31.01	.1	31.24	.6	31.47
.2	30.79	.7	31.02	.2	31.25	.7	31.47
.3	30.80	.8	31.03	.3	31.25	.8	31.48
.4	30.81	.9	31.03	.4	31.26	.9	31.49
.5	30.81	479.0	31.04	.5	31.27	486.0	31.49

3\*



486.1—500.0

31.50—32.40

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
486.1	31.50	489.6	31.73	493.1	31.95	496.6	32.18
.2	31.51	.7	31.73	.2	31.96	.7	32.19
.3	31.51	.8	31.74	.3	31.97	.8	32.19
.4	31.52	.9	31.75	.4	31.97	.9	32.20
.5	31.53	490.0	31.75	.5	31.98	497.0	32.21
.6	31.53	.1	31.76	.6	31.99	.1	32.21
.7	31.54	.2	31.77	.7	31.99	.2	32.22
.8	31.54	.3	31.77	.8	32.00	.3	32.23
.9	31.55	.4	31.78	.9	32.00	.4	32.23
487.0	31.56	.5	31.78	494.0	32.01	.5	32.24
.1	31.56	.6	31.79	.1	32.02	.6	32.24
.2	31.57	.7	31.80	.2	32.02	.7	32.25
.3	31.58	.8	31.80	.3	32.03	.8	32.26
.4	31.58	.9	31.81	.4	32.04	.9	32.26
.5	31.59	491.0	31.82	.5	32.04	498.0	32.27
.6	31.60	.1	31.82	.6	32.05	.1	32.28
.7	31.60	.2	31.83	.7	32.06	.2	32.28
.8	31.61	.3	31.84	.8	32.06	.3	32.29
.9	31.62	.4	31.84	.9	32.07	.4	32.30
488.0	31.62	.5	31.85	495.0	32.08	.5	32.30
.1	31.63	.6	31.86	.1	32.08	.6	32.31
.2	31.64	.7	31.86	.2	32.09	.7	32.32
.3	31.64	.8	31.87	.3	32.10	.8	32.32
.4	31.65	.9	31.88	.4	32.10	.9	32.33
.5	31.65	492.0	31.88	.5	32.11	499.0	32.34
.6	31.66	.1	31.89	.6	32.11	.1	32.34
.7	31.67	.2	31.89	.7	32.12	.2	32.35
.8	31.67	.3	31.90	.8	32.13	.3	32.35
.9	31.68	.4	31.91	.9	32.13	.4	32.36
489.0	31.69	.5	31.91	496.0	32.14	.5	32.37
.1	31.69	.6	31.92	.1	32.15	.6	32.37
.2	31.70	.7	31.93	.2	32.15	.7	32.38
.3	31.71	.8	31.93	.3	32.16	.8	32.39
.4	31.71	.9	31.94	.4	32.17	.9	32.39
.5	31.72	493.0	31.95	.5	32.17	500.0	32.40

500.1—514.0

32.41—33.31

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
500.1	32.41	503.6	32.63	507.1	32.86	510.6	33.09
.2	32.41	.7	32.64	.2	32.87	.7	33.09
.3	32.42	.8	32.65	.3	32.87	.8	33.10
.4	32.43	.9	32.65	.4	32.88	.9	33.11
.5	32.43	504.0	32.66	.5	32.89	511.0	33.11
.6	32.44	.1	32.67	.6	32.89	.1	33.12
.7	32.45	.2	32.67	.7	32.90	.2	33.13
.8	32.45	.3	32.68	.8	32.91	.3	33.13
.9	32.46	.4	32.69	.9	32.91	.4	33.14
501.0	32.46	.5	32.69	508.0	32.92	.5	33.15
.1	32.47	.6	32.70	.1	32.92	.6	33.15
.2	32.48	.7	32.70	.2	32.93	.7	33.16
.3	32.48	.8	32.71	.3	32.94	.8	33.16
.4	32.49	.9	32.72	.4	32.94	.9	33.17
.5	32.50	505.0	32.72	.5	32.95	512.0	33.18
.6	32.50	.1	32.73	.6	32.96	.1	33.18
.7	32.51	.2	32.74	.7	32.96	.2	33.19
.8	32.52	.3	32.74	.8	32.97	.3	33.20
.9	32.52	.4	32.75	.9	32.98	.4	33.20
502.0	32.53	.5	32.76	509.0	32.98	.5	33.21
.1	32.54	.6	32.76	.1	32.99	.6	33.22
.2	32.54	.7	32.77	.2	33.00	.7	33.22
.3	32.55	.8	32.78	.3	33.00	.8	33.23
.4	32.56	.9	32.78	.4	33.01	.9	33.24
.5	32.56	506.0	32.79	.5	33.02	513.0	33.24
.6	32.57	.1	32.80	.6	33.02	.1	33.25
.7	32.58	.2	32.80	.7	33.03	.2	33.26
.8	32.58	.3	32.81	.8	33.04	.3	33.26
.9	32.59	.4	32.81	.9	33.04	.4	33.27
503.0	32.59	.5	32.82	510.0	33.05	.5	33.27
.1	32.60	.6	32.83	.1	33.05	.6	33.28
.2	32.61	.7	32.83	.2	33.06	.7	33.29
.3	32.61	.8	32.84	.3	33.07	.8	33.29
.4	32.62	.9	32.85	.4	33.07	.9	33.30
.5	32.63	507.0	32.85	.5	33.08	514.0	33.31

514.1—528.0

33.31—34.21

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
514.1	33.31	517.6	33.54	521.1	33.77	524.6	33.99
.2	33.32	.7	33.55	.2	33.77	.7	34.00
.3	33.33	.8	33.55	.3	33.78	.8	34.01
.4	33.33	.9	33.56	.4	33.79	.9	34.01
.5	33.34	518.0	33.57	.5	33.79	525.0	34.02
.6	33.35	.1	33.57	.6	33.80	.1	34.03
.7	33.35	.2	33.58	.7	33.81	.2	34.03
.8	33.36	.3	33.59	.8	33.81	.3	34.04
.9	33.37	.4	33.59	.9	33.82	.4	34.05
515.0	33.37	.5	33.60	522.0	33.83	.5	34.05
.1	33.38	.6	33.61	.1	33.83	.6	34.06
.2	33.39	.7	33.61	.2	33.84	.7	34.07
.3	33.39	.8	33.62	.3	33.85	.8	34.07
.4	33.40	.9	33.62	.4	33.85	.9	34.08
.5	33.40	519.0	33.63	.5	33.86	526.0	34.08
.6	33.41	.1	33.64	.6	33.86	.1	34.09
.7	33.42	.2	33.64	.7	33.87	.2	34.10
.8	33.42	.3	33.65	.8	33.88	.3	34.10
.9	33.43	.4	33.66	.9	33.88	.4	34.11
516.0	33.44	.5	33.66	523.0	33.89	.5	34.12
.1	33.44	.6	33.67	.1	33.90	.6	34.12
.2	33.45	.7	33.68	.2	33.90	.7	34.13
.3	33.46	.8	33.68	.3	33.91	.8	34.14
.4	33.46	.9	33.69	.4	33.92	.9	34.14
.5	33.47	520.0	33.70	.5	33.92	527.0	34.15
.6	33.48	.1	33.70	.6	33.93	.1	34.16
.7	33.48	.2	33.71	.7	33.94	.2	34.16
.8	33.49	.3	33.72	.8	33.94	.3	34.17
.9	33.50	.4	33.72	.9	33.95	.4	34.18
517.0	33.50	.5	33.73	524.0	33.96	.5	34.18
.1	33.51	.6	33.73	.1	33.96	.6	34.19
.2	33.51	.7	33.74	.2	33.97	.7	34.19
.3	33.52	.8	33.75	.3	33.97	.8	34.20
.4	33.53	.9	33.75	.4	33.98	.9	34.21
.5	33.53	521.0	33.76	.5	33.99	528.0	34.21

Decimal Grains to Grams

39

528.1—542.0

34.22—35.12

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
528.1	34.22	531.6	34.45	535.1	34.67	538.6	34.90
.2	34.23	.7	34.45	.2	34.68	.7	34.91
.3	34.23	.8	34.46	.3	34.69	.8	34.91
.4	34.24	.9	34.47	.4	34.69	.9	34.92
.5	34.25	532.0	34.47	.5	34.70	539.0	34.93
.6	34.25	.1	34.48	.6	34.71	.1	34.93
.7	34.26	.2	34.49	.7	34.71	.2	34.94
.8	34.27	.3	34.49	.8	34.72	.3	34.95
.9	34.27	.4	34.50	.9	34.73	.4	34.95
529.0	34.28	.5	34.51	536.0	34.73	.5	34.96
.1	34.29	.6	34.51	.1	34.74	.6	34.97
.2	34.29	.7	34.52	.2	34.75	.7	34.97
.3	34.30	.8	34.53	.3	34.75	.8	34.98
.4	34.31	.9	34.53	.4	34.76	.9	34.99
.5	34.31	533.0	34.54	.5	34.77	540.0	34.99
.6	34.32	.1	34.54	.6	34.77	.1	35.00
.7	34.32	.2	34.55	.7	34.78	.2	35.00
.8	34.33	.3	34.56	.8	34.78	.3	35.01
.9	34.34	.4	34.56	.9	34.79	.4	35.02
530.0	34.34	.5	34.57	537.0	34.80	.5	35.02
.1	34.35	.6	34.58	.1	34.80	.6	35.03
.2	34.36	.7	34.58	.2	34.81	.7	35.04
.3	34.36	.8	34.59	.3	34.82	.8	35.04
.4	34.37	.9	34.60	.4	34.82	.9	35.05
.5	34.38	534.0	34.60	.5	34.83	541.0	35.06
.6	34.38	.1	34.61	.6	34.84	.1	35.06
.7	34.39	.2	34.62	.7	34.84	.2	35.07
.8	34.40	.3	34.62	.8	34.85	.3	35.08
.9	34.40	.4	34.63	.9	34.86	.4	35.08
531.0	34.41	.5	34.64	538.0	34.86	.5	35.09
.1	34.42	.6	34.64	.1	34.87	.6	35.10
.2	34.42	.7	34.65	.2	34.88	.7	35.10
.3	34.43	.8	34.66	.3	34.88	.8	35.11
.4	34.43	.9	34.66	.4	34.89	.9	35.12
.5	34.44	535.0	34.67	.5	34.89	542.0	35.12

542.1—556.0

35.13—36.03

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
542.1	35.13	545.6	35.35	549.1	35.58	552.6	35.81
.2	35.13	.7	35.36	.2	35.59	.7	35.81
.3	35.14	.8	35.37	.3	35.59	.8	35.82
.4	35.15	.9	35.37	.4	35.60	.9	35.83
.5	35.15	546.0	35.38	.5	35.61	553.0	35.83
.6	35.16	.1	35.39	.6	35.61	.1	35.84
.7	35.17	.2	35.39	.7	35.62	.2	35.85
.8	35.17	.3	35.40	.8	35.63	.3	35.85
.9	35.18	.4	35.41	.9	35.63	.4	35.86
543.0	35.19	.5	35.41	550.0	35.64	.5	35.87
.1	35.19	.6	35.42	.1	35.65	.6	35.87
.2	35.20	.7	35.43	.2	35.65	.7	35.88
.3	35.21	.8	35.43	.3	35.66	.8	35.89
.4	35.21	.9	35.44	.4	35.67	.9	35.89
.5	35.22	547.0	35.45	.5	35.67	554.0	35.90
.6	35.23	.1	35.45	.6	35.68	.1	35.91
.7	35.23	.2	35.46	.7	35.69	.2	35.91
.8	35.24	.3	35.47	.8	35.69	.3	35.92
.9	35.24	.4	35.47	.9	35.70	.4	35.93
544.0	35.25	.5	35.48	551.0	35.70	.5	35.93
.1	35.26	.6	35.48	.1	35.71	.6	35.94
.2	35.26	.7	35.49	.2	35.72	.7	35.94
.3	35.27	.8	35.50	.3	35.72	.8	35.95
.4	35.28	.9	35.50	.4	35.73	.9	35.96
.5	35.28	548.0	35.51	.5	35.74	555.0	35.96
.6	35.29	.1	35.52	.6	35.74	.1	35.97
.7	35.30	.2	35.52	.7	35.75	.2	35.98
.8	35.30	.3	35.53	.8	35.76	.3	35.98
.9	35.31	.4	35.54	.9	35.76	.4	35.99
545.0	35.32	.5	35.54	552.0	35.77	.5	36.00
.1	35.32	.6	35.55	.1	35.78	.6	36.00
.2	35.33	.7	35.56	.2	35.78	.7	36.01
.3	35.34	.8	35.56	.3	35.79	.8	36.02
.4	35.34	.9	35.57	.4	35.80	.9	36.02
.5	35.35	549.0	35.58	.5	35.80	556.0	36.03

Decimal Grains to Grams

41

556.1—570.0

36.04—36.94

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
556.1	36.04	559.6	36.26	563.1	36.49	566.6	36.72
.2	36.04	.7	36.27	.2	36.50	.7	36.72
.3	36.05	.8	36.28	.3	36.50	.8	36.73
.4	36.05	.9	36.28	.4	36.51	.9	36.74
.5	36.06	560.0	36.29	.5	36.51	567.0	36.74
.6	36.07	.1	36.29	.6	36.52	.1	36.75
.7	36.07	.2	36.30	.7	36.53	.2	36.75
.8	36.08	.3	36.31	.8	36.53	.3	36.76
.9	36.09	.4	36.31	.9	36.54	.4	36.77
557.0	36.09	.5	36.32	564.0	36.55	.5	36.77
.1	36.10	.6	36.33	.1	36.55	.6	36.78
.2	36.11	.7	36.33	.2	36.56	.7	36.79
.3	36.11	.8	36.34	.3	36.57	.8	36.79
.4	36.12	.9	36.35	.4	36.57	.9	36.80
.5	36.13	561.0	36.35	.5	36.58	568.0	36.81
.6	36.13	.1	36.36	.6	36.59	.1	36.81
.7	36.14	.2	36.37	.7	36.59	.2	36.82
.8	36.15	.3	36.37	.8	36.60	.3	36.83
.9	36.15	.4	36.38	.9	36.61	.4	36.83
558.0	36.16	.5	36.39	565.0	36.61	.5	36.84
.1	36.16	.6	36.39	.1	36.62	.6	36.85
.2	36.17	.7	36.40	.2	36.62	.7	36.85
.3	36.18	.8	36.40	.3	36.63	.8	36.86
.4	36.18	.9	36.41	.4	36.64	.9	36.86
.5	36.19	562.0	36.42	.5	36.64	569.0	36.87
.6	36.20	.1	36.42	.6	36.65	.1	36.88
.7	36.20	.2	36.43	.7	36.66	.2	36.88
.8	36.21	.3	36.44	.8	36.66	.3	36.89
.9	36.22	.4	36.44	.9	36.67	.4	36.90
559.0	36.22	.5	36.45	566.0	36.68	.5	36.90
.1	36.23	.6	36.46	.1	36.68	.6	36.91
.2	36.24	.7	36.46	.2	36.69	.7	36.92
.3	36.24	.8	36.47	.3	36.70	.8	36.92
.4	36.25	.9	36.48	.4	36.70	.9	36.93
.5	36.26	563.0	36.48	.5	36.71	570.0	36.94

570.1—584.0

36.94—37.84

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
570.1	36.94	573.6	37.17	577.1	37.40	580.6	37.62
.2	36.95	.7	37.18	.2	37.40	.7	37.63
.3	36.96	.8	37.18	.3	37.41	.8	37.64
.4	36.96	.9	37.19	.4	37.42	.9	37.64
.5	36.97	574.0	37.20	.5	37.42	581.0	37.65
.6	36.97	.1	37.20	.6	37.43	.1	37.66
.7	36.98	.2	37.21	.7	37.43	.2	37.66
.8	36.99	.3	37.21	.8	37.44	.3	37.67
.9	36.99	.4	37.22	.9	37.45	.4	37.67
571.0	37.00	.5	37.23	578.0	37.45	.5	37.68
.1	37.01	.6	37.23	.1	37.46	.6	37.69
.2	37.01	.7	37.24	.2	37.47	.7	37.69
.3	37.02	.8	37.25	.3	37.47	.8	37.70
.4	37.03	.9	37.25	.4	37.48	.9	37.71
.5	37.03	575.0	37.26	.5	37.49	582.0	37.71
.6	37.04	.1	37.27	.6	37.49	.1	37.72
.7	37.05	.2	37.27	.7	37.50	.2	37.73
.8	37.05	.3	37.28	.8	37.51	.3	37.73
.9	37.06	.4	37.29	.9	37.51	.4	37.74
572.0	37.07	.5	37.29	579.0	37.52	.5	37.75
.1	37.07	.6	37.30	.1	37.53	.6	37.75
.2	37.08	.7	37.31	.2	37.53	.7	37.76
.3	37.09	.8	37.31	.3	37.54	.8	37.77
.4	37.09	.9	37.32	.4	37.55	.9	37.77
.5	37.10	576.0	37.32	.5	37.55	583.0	37.78
.6	37.10	.1	37.33	.6	37.56	.1	37.78
.7	37.11	.2	37.34	.7	37.56	.2	37.79
.8	37.12	.3	37.34	.8	37.57	.3	37.80
.9	37.12	.4	37.35	.9	37.58	.4	37.80
573.0	37.13	.5	37.36	580.0	37.58	.5	37.81
.1	37.14	.6	37.36	.1	37.59	.6	37.82
.2	37.14	.7	37.37	.2	37.60	.7	37.82
.3	37.15	.8	37.38	.3	37.60	.8	37.83
.4	37.16	.9	37.38	.4	37.61	.9	37.84
.5	37.16	577.0	37.39	.5	37.62	584.0	37.84

Decimal Grains to Grams

43

584.1—598.0

37.85—38.75

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
584.1	37.85	587.6	38.08	591.1	38.30	594.6	38.53
.2	37.86	.7	38.08	.2	38.31	.7	38.54
.3	37.86	.8	38.09	.3	38.32	.8	38.54
.4	37.87	.9	38.10	.4	38.32	.9	38.55
.5	37.88	588.0	38.10	.5	38.33	595.0	38.56
.6	37.88	.1	38.11	.6	38.34	.1	38.56
.7	37.89	.2	38.12	.7	38.34	.2	38.57
.8	37.90	.3	38.12	.8	38.35	.3	38.58
.9	37.90	.4	38.13	.9	38.36	.4	38.58
585.0	37.91	.5	38.13	592.0	38.36	.5	38.59
.1	37.91	.6	38.14	.1	38.37	.6	38.59
.2	37.92	.7	38.15	.2	38.37	.7	38.60
.3	37.93	.8	38.15	.3	38.38	.8	38.61
.4	37.93	.9	38.16	.4	38.39	.9	38.61
.5	37.94	589.0	38.17	.5	38.39	596.0	38.62
.6	37.95	.1	38.17	.6	38.40	.1	38.63
.7	37.95	.2	38.18	.7	38.41	.2	38.63
.8	37.96	.3	38.19	.8	38.41	.3	38.64
.9	37.97	.4	38.19	.9	38.42	.4	38.65
586.0	37.97	.5	38.20	593.0	38.43	.5	38.65
.1	37.98	.6	38.21	.1	38.43	.6	38.66
.2	37.99	.7	38.21	.2	38.44	.7	38.67
.3	37.99	.8	38.22	.3	38.45	.8	38.67
.4	38.00	.9	38.23	.4	38.45	.9	38.68
.5	38.01	590.0	38.23	.5	38.46	597.0	38.69
.6	38.01	.1	38.24	.6	38.47	.1	38.69
.7	38.02	.2	38.24	.7	38.47	.2	38.70
.8	38.02	.3	38.25	.8	38.48	.3	38.70
.9	38.03	.4	38.26	.9	38.48	.4	38.71
587.0	38.04	.5	38.26	594.0	38.49	.5	38.72
.1	38.04	.6	38.27	.1	38.50	.6	38.72
.2	38.05	.7	38.28	.2	38.50	.7	38.73
.3	38.06	.8	38.28	.3	38.51	.8	38.74
.4	38.06	.9	38.29	.4	38.52	.9	38.74
.5	38.07	591.0	38.30	.5	38.52	598.0	38.75



598.1—612.0

38.76—39.66

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
598.1	38.76	601.6	38.98	605.1	39.21	608.6	39.44
.2	38.76	.7	38.99	.2	39.22	.7	39.44
.3	38.77	.8	39.00	.3	39.22	.8	39.45
.4	38.78	.9	39.00	.4	39.23	.9	39.46
.5	38.78	602.0	39.01	.5	39.24	609.0	39.46
.6	38.79	.1	39.02	.6	39.24	.1	39.47
.7	38.80	.2	39.02	.7	39.25	.2	39.48
.8	38.80	.3	39.03	.8	39.26	.3	39.48
.9	38.81	.4	39.04	.9	39.26	.4	39.49
599.0	38.82	.5	39.04	606.0	39.27	.5	39.50
.1	38.82	.6	39.05	.1	39.28	.6	39.50
.2	38.83	.7	39.05	.2	39.28	.7	39.51
.3	38.83	.8	39.06	.3	39.29	.8	39.51
.4	38.84	.9	39.07	.4	39.29	.9	39.52
.5	38.85	603.0	39.07	.5	39.30	610.0	39.53
.6	38.85	.1	39.08	.6	39.31	.1	39.53
.7	38.86	.2	39.09	.7	39.31	.2	39.54
.8	38.87	.3	39.09	.8	39.32	.3	39.55
.9	38.87	.4	39.10	.9	39.33	.4	39.55
600.0	38.88	.5	39.11	607.0	39.33	.5	39.56
.1	38.89	.6	39.11	.1	39.34	.6	39.57
.2	38.89	.7	39.12	.2	39.35	.7	39.57
.3	38.90	.8	39.13	.3	39.35	.8	39.58
.4	38.91	.9	39.13	.4	39.36	.9	39.59
.5	38.91	604.0	39.14	.5	39.37	611.0	39.59
.6	38.92	.1	39.15	.6	39.37	.1	39.60
.7	38.93	.2	39.15	.7	39.38	.2	39.61
.8	38.93	.3	39.16	.8	39.39	.3	39.61
.9	38.94	.4	39.17	.9	39.39	.4	39.62
601.0	38.94	.5	39.17	608.0	39.40	.5	39.63
.1	38.95	.6	39.18	.1	39.40	.6	39.63
.2	38.96	.7	39.18	.2	39.41	.7	39.64
.3	38.96	.8	39.19	.3	39.42	.8	39.64
.4	38.97	.9	39.20	.4	39.42	.9	39.65
.5	38.98	605.0	39.20	.5	39.43	612.0	39.66

Decimal Grains to Grams

45

612.1—626.0

39.66—40.56

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
612.1	39.66	615.6	39.89	619.1	40.12	622.6	40.34
.2	39.67	.7	39.90	.2	40.12	.7	40.35
.3	39.68	.8	39.90	.3	40.13	.8	40.36
.4	39.68	.9	39.91	.4	40.14	.9	40.36
.5	39.69	616.0	39.92	.5	40.14	623.0	40.37
.6	39.70	.1	39.92	.6	40.15	.1	40.38
.7	39.70	.2	39.93	.7	40.16	.2	40.38
.8	39.71	.3	39.94	.8	40.16	.3	40.39
.9	39.72	.4	39.94	.9	40.17	.4	40.40
613.0	39.72	.5	39.95	620.0	40.18	.5	40.40
.1	39.73	.6	39.96	.1	40.18	.6	40.41
.2	39.74	.7	39.96	.2	40.19	.7	40.42
.3	39.74	.8	39.97	.3	40.20	.8	40.42
.4	39.75	.9	39.98	.4	40.20	.9	40.43
.5	39.75	617.0	39.98	.5	40.21	624.0	40.44
.6	39.76	.1	39.99	.6	40.21	.1	40.44
.7	39.77	.2	39.99	.7	40.22	.2	40.45
.8	39.77	.3	40.00	.8	40.23	.3	40.45
.9	39.78	.4	40.01	.9	40.23	.4	40.46
614.0	39.79	.5	40.01	621.0	40.24	.5	40.47
.1	39.79	.6	40.02	.1	40.25	.6	40.47
.2	39.80	.7	40.03	.2	40.25	.7	40.48
.3	39.81	.8	40.03	.3	40.26	.8	40.49
.4	39.81	.9	40.04	.4	40.27	.9	40.49
.5	39.82	618.0	40.05	.5	40.27	625.0	40.50
.6	39.83	.1	40.05	.6	40.28	.1	40.51
.7	39.83	.2	40.06	.7	40.29	.2	40.51
.8	39.84	.3	40.07	.8	40.29	.3	40.52
.9	39.85	.4	40.07	.9	40.30	.4	40.53
615.0	39.85	.5	40.08	622.0	40.31	.5	40.53
.1	39.86	.6	40.09	.1	40.31	.6	40.54
.2	39.86	.7	40.09	.2	40.32	.7	40.55
.3	39.87	.8	40.10	.3	40.32	.8	40.55
.4	39.88	.9	40.10	.4	40.33	.9	40.56
.5	39.88	619.0	40.11	.5	40.34	626.0	40.56

626.1—640.0

40.57—41.47

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
626.1	40.57	629.6	40.80	633.1	41.02	636.6	41.25
.2	40.58	.7	40.80	.2	41.03	.7	41.26
.3	40.58	.8	40.81	.3	41.04	.8	41.26
.4	40.59	.9	40.82	.4	41.04	.9	41.27
.5	40.60	630.0	40.82	.5	41.05	637.0	41.28
.6	40.60	.1	40.83	.6	41.06	.1	41.28
.7	40.61	.2	40.84	.7	41.06	.2	41.29
.8	40.62	.3	40.84	.8	41.07	.3	41.30
.9	40.62	.4	40.85	.9	41.08	.4	41.30
627.0	40.63	.5	40.86	634.0	41.08	.5	41.31
.1	40.64	.6	40.86	.1	41.09	.6	41.32
.2	40.64	.7	40.87	.2	41.10	.7	41.32
.3	40.65	.8	40.88	.3	41.10	.8	41.33
.4	40.66	.9	40.88	.4	41.11	.9	41.34
.5	40.66	631.0	40.89	.5	41.12	638.0	41.34
.6	40.67	.1	40.90	.6	41.12	.1	41.35
.7	40.67	.2	40.90	.7	41.13	.2	41.36
.8	40.68	.3	40.91	.8	41.13	.3	41.36
.9	40.69	.4	40.91	.9	41.14	.4	41.37
628.0	40.69	.5	40.92	635.0	41.15	.5	41.37
.1	40.70	.6	40.93	.1	41.15	.6	41.38
.2	40.71	.7	40.93	.2	41.16	.7	41.39
.3	40.71	.8	40.94	.3	41.17	.8	41.39
.4	40.72	.9	40.95	.4	41.17	.9	41.40
.5	40.73	632.0	40.95	.5	41.18	639.0	41.41
.6	40.73	.1	40.96	.6	41.19	.1	41.41
.7	40.74	.2	40.97	.7	41.19	.2	41.42
.8	40.75	.3	40.97	.8	41.20	.3	41.43
.9	40.75	.4	40.98	.9	41.21	.4	41.43
629.0	40.76	.5	40.99	636.0	41.21	.5	41.44
.1	40.77	.6	40.99	.1	41.22	.6	41.45
.2	40.77	.7	41.00	.2	41.23	.7	41.45
.3	40.78	.8	41.01	.3	41.23	.8	41.46
.4	40.79	.9	41.01	.4	41.24	.9	41.47
.5	40.79	633.0	41.02	.5	41.25	640.0	41.47

Decimal Grains to Grams

47

640.1—654.0

41.48—42.38

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
640.1	41.48	643.6	41.71	647.1	41.93	650.6	42.16
.2	41.48	.7	41.71	.2	41.94	.7	42.17
.3	41.49	.8	41.72	.3	41.94	.8	42.17
.4	41.50	.9	41.72	.4	41.95	.9	42.18
.5	41.50	644.0	41.73	.5	41.96	651.0	42.18
.6	41.51	.1	41.74	.6	41.96	.1	42.19
.7	41.52	.2	41.74	.7	41.97	.2	42.20
.8	41.52	.3	41.75	.8	41.98	.3	42.20
.9	41.53	.4	41.76	.9	41.98	.4	42.21
641.0	41.54	.5	41.76	648.0	41.99	.5	42.22
.1	41.54	.6	41.77	.1	42.00	.6	42.22
.2	41.55	.7	41.78	.2	42.00	.7	42.23
.3	41.56	.8	41.78	.3	42.01	.8	42.24
.4	41.56	.9	41.79	.4	42.02	.9	42.24
.5	41.57	645.0	41.80	.5	42.02	652.0	42.25
.6	41.58	.1	41.80	.6	42.03	.1	42.26
.7	41.58	.2	41.81	.7	42.04	.2	42.26
.8	41.59	.3	41.82	.8	42.04	.3	42.27
.9	41.60	.4	41.82	.9	42.05	.4	42.28
642.0	41.60	.5	41.83	649.0	42.06	.5	42.28
.1	41.61	.6	41.83	.1	42.06	.6	42.29
.2	41.61	.7	41.84	.2	42.07	.7	42.29
.3	41.62	.8	41.85	.3	42.07	.8	42.30
.4	41.63	.9	41.85	.4	42.08	.9	42.31
.5	41.63	646.0	41.86	.5	42.09	653.0	42.31
.6	41.64	.1	41.87	.6	42.09	.1	42.32
.7	41.65	.2	41.87	.7	42.10	.2	42.33
.8	41.65	.3	41.88	.8	42.11	.3	42.33
.9	41.66	.4	41.89	.9	42.11	.4	42.34
643.0	41.67	.5	41.89	650.0	42.12	.5	42.35
.1	41.67	.6	41.90	.1	42.13	.6	42.35
.2	41.68	.7	41.91	.2	42.13	.7	42.36
.3	41.69	.8	41.91	.3	42.14	.8	42.37
.4	41.69	.9	41.92	.4	42.15	.9	42.37
.5	41.70	647.0	41.93	.5	42.15	654.0	42.38

654.1—668.0

42.39—43.29

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
654.1	42.39	657.6	42.61	661.1	42.84	664.6	43.07
.2	42.39	.7	42.62	.2	42.85	.7	43.07
.3	42.40	.8	42.63	.3	42.85	.8	43.08
.4	42.41	.9	42.63	.4	42.86	.9	43.09
.5	42.41	658.0	42.64	.5	42.87	665.0	43.09
.6	42.42	.1	42.64	.6	42.87	.1	43.10
.7	42.42	.2	42.65	.7	42.88	.2	43.10
.8	42.43	.3	42.66	.8	42.88	.3	43.11
.9	42.44	.4	42.66	.9	42.89	.4	43.12
655.0	42.44	.5	42.67	662.0	42.90	.5	43.12
.1	42.45	.6	42.68	.1	42.90	.6	43.13
.2	42.46	.7	42.68	.2	42.91	.7	43.14
.3	42.46	.8	42.69	.3	42.92	.8	43.14
.4	42.47	.9	42.70	.4	42.92	.9	43.15
.5	42.48	659.0	42.70	.5	42.93	666.0	43.16
.6	42.48	.1	42.71	.6	42.94	.1	43.16
.7	42.49	.2	42.72	.7	42.94	.2	43.17
.8	42.50	.3	42.72	.8	42.95	.3	43.18
.9	42.50	.4	42.73	.9	42.96	.4	43.18
656.0	42.51	.5	42.74	663.0	42.96	.5	43.19
.1	42.52	.6	42.74	.1	42.97	.6	43.20
.2	42.52	.7	42.75	.2	42.98	.7	43.20
.3	42.53	.8	42.75	.3	42.98	.8	43.21
.4	42.53	.9	42.76	.4	42.99	.9	43.22
.5	42.54	660.0	42.77	.5	42.99	667.0	43.22
.6	42.55	.1	42.77	.6	43.00	.1	43.23
.7	42.55	.2	42.78	.7	43.01	.2	43.23
.8	42.56	.3	42.79	.8	43.01	.3	43.24
.9	42.57	.4	42.79	.9	43.02	.4	43.25
657.0	42.57	.5	42.80	664.0	43.03	.5	43.25
.1	42.58	.6	42.81	.1	43.03	.6	43.26
.2	42.59	.7	42.81	.2	43.04	.7	43.27
.3	42.59	.8	42.82	.3	43.05	.8	43.27
.4	42.60	.9	42.83	.4	43.05	.9	43.28
.5	42.61	661.0	42.83	.5	43.06	668.0	43.29

Decimal Grains to Grams

49

668.1—682.0

43.29—44.19

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
668.1	43.29	671.6	43.52	675.1	43.75	678.6	43.97
.2	43.30	.7	43.53	.2	43.75	.7	43.98
.3	43.31	.8	43.53	.3	43.76	.8	43.99
.4	43.31	.9	43.54	.4	43.77	.9	43.99
.5	43.32	672.0	43.55	.5	43.77	679.0	44.00
.6	43.33	.1	43.55	.6	43.78	.1	44.01
.7	43.33	.2	43.56	.7	43.79	.2	44.01
.8	43.34	.3	43.56	.8	43.79	.3	44.02
.9	43.34	.4	43.57	.9	43.80	.4	44.02
669.0	43.35	.5	43.58	676.0	43.80	.5	44.03
.1	43.36	.6	43.58	.1	43.81	.6	44.04
.2	43.36	.7	43.59	.2	43.82	.7	44.04
.3	43.37	.8	43.60	.3	43.82	.8	44.05
.4	43.38	.9	43.60	.4	43.83	.9	44.06
.5	43.38	673.0	43.61	.5	43.84	680.0	44.06
.6	43.39	.1	43.62	.6	43.84	.1	44.07
.7	43.40	.2	43.62	.7	43.85	.2	44.08
.8	43.40	.3	43.63	.8	43.86	.3	44.08
.9	43.41	.4	43.64	.9	43.86	.4	44.09
670.0	43.42	.5	43.64	677.0	43.87	.5	44.10
.1	43.42	.6	43.65	.1	43.88	.6	44.10
.2	43.43	.7	43.66	.2	43.88	.7	44.11
.3	43.44	.8	43.66	.3	43.89	.8	44.12
.4	43.44	.9	43.67	.4	43.90	.9	44.12
.5	43.45	674.0	43.68	.5	43.90	681.0	44.13
.6	43.45	.1	43.68	.6	43.91	.1	44.14
.7	43.46	.2	43.69	.7	43.91	.2	44.14
.8	43.47	.3	43.69	.8	43.92	.3	44.15
.9	43.47	.4	43.70	.9	43.93	.4	44.15
671.0	43.48	.5	43.71	678.0	43.93	.5	44.16
.1	43.49	.6	43.71	.1	43.94	.6	44.17
.2	43.49	.7	43.72	.2	43.95	.7	44.17
.3	43.50	.8	43.73	.3	43.95	.8	44.18
.4	43.51	.9	43.73	.4	43.96	.9	44.19
.5	43.51	675.0	43.74	.5	43.97	682.0	44.19

682.1—696.0

44.20—45.10

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
682.1	44.20	685.6	44.43	689.1	44.65	692.6	44.88
.2	44.21	.7	44.43	.2	44.66	.7	44.89
.3	44.21	.8	44.44	.3	44.67	.8	44.89
.4	44.22	.9	44.45	.4	44.67	.9	44.90
.5	44.23	686.0	44.45	.5	44.68	693.0	44.91
.6	44.23	.1	44.46	.6	44.69	.1	44.91
.7	44.24	.2	44.47	.7	44.69	.2	44.92
.8	44.25	.3	44.47	.8	44.70	.3	44.93
.9	44.25	.4	44.48	.9	44.71	.4	44.93
683.0	44.26	.5	44.49	690.0	44.71	.5	44.94
.1	44.26	.6	44.49	.1	44.72	.6	44.95
.2	44.27	.7	44.50	.2	44.72	.7	44.95
.3	44.28	.8	44.50	.3	44.73	.8	44.96
.4	44.28	.9	44.51	.4	44.74	.9	44.96
.5	44.29	687.0	44.52	.5	44.74	694.0	44.97
.6	44.30	.1	44.52	.6	44.75	.1	44.98
.7	44.30	.2	44.53	.7	44.76	.2	44.98
.8	44.31	.3	44.54	.8	44.76	.3	44.99
.9	44.32	.4	44.54	.9	44.77	.4	45.00
684.0	44.32	.5	44.55	691.0	44.78	.5	45.00
.1	44.33	.6	44.56	.1	44.78	.6	45.01
.2	44.34	.7	44.56	.2	44.79	.7	45.02
.3	44.34	.8	44.57	.3	44.80	.8	45.02
.4	44.35	.9	44.58	.4	44.80	.9	45.03
.5	44.36	688.0	44.58	.5	44.81	695.0	45.04
.6	44.36	.1	44.59	.6	44.82	.1	45.04
.7	44.37	.2	44.60	.7	44.82	.2	45.05
.8	44.37	.3	44.60	.8	44.83	.3	45.06
.9	44.38	.4	44.61	.9	44.83	.4	45.06
685.0	44.39	.5	44.61	692.0	44.84	.5	45.07
.1	44.39	.6	44.62	.1	44.85	.6	45.07
.2	44.40	.7	44.63	.2	44.85	.7	45.08
.3	44.41	.8	44.63	.3	44.86	.8	45.09
.4	44.41	.9	44.64	.4	44.87	.9	45.09
.5	44.42	689.0	44.65	.5	44.87	696.0	45.10

Decimal Grains to Grams

51

696.1—710.0

45.11—46.01

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
696.1	45.11	699.6	45.33	703.1	45.56	706.6	45.79
.2	45.11	.7	45.34	.2	45.57	.7	45.79
.3	45.12	.8	45.35	.3	45.57	.8	45.80
.4	45.13	.9	45.35	.4	45.58	.9	45.81
.5	45.13	700.0	45.36	.5	45.59	707.0	45.81
.6	45.14	.1	45.37	.6	45.59	.1	45.82
.7	45.15	.2	45.37	.7	45.60	.2	45.83
.8	45.15	.3	45.38	.8	45.61	.3	45.83
.9	45.16	.4	45.39	.9	45.61	.4	45.84
697.0	45.17	.5	45.39	704.0	45.62	.5	45.85
.1	45.17	.6	45.40	.1	45.63	.6	45.85
.2	45.18	.7	45.41	.2	45.63	.7	45.86
.3	45.18	.8	45.41	.3	45.64	.8	45.87
.4	45.19	.9	45.42	.4	45.64	.9	45.87
.5	45.20	701.0	45.42	.5	45.65	708.0	45.88
.6	45.20	.1	45.43	.6	45.66	.1	45.88
.7	45.21	.2	45.44	.7	45.66	.2	45.89
.8	45.22	.3	45.44	.8	45.67	.3	45.90
.9	45.22	.4	45.45	.9	45.68	.4	45.90
698.0	45.23	.5	45.46	705.0	45.68	.5	45.91
.1	45.24	.6	45.46	.1	45.69	.6	45.92
.2	45.24	.7	45.47	.2	45.70	.7	45.92
.3	45.25	.8	45.48	.3	45.70	.8	45.93
.4	45.26	.9	45.48	.4	45.71	.9	45.94
.5	45.26	702.0	45.49	.5	45.72	709.0	45.94
.6	45.27	.1	45.50	.6	45.72	.1	45.95
.7	45.28	.2	45.50	.7	45.73	.2	45.96
.8	45.28	.3	45.51	.8	45.74	.3	45.96
.9	45.29	.4	45.52	.9	45.74	.4	45.97
699.0	45.30	.5	45.52	706.0	45.75	.5	45.98
.1	45.30	.6	45.53	.1	45.76	.6	45.98
.2	45.31	.7	45.53	.2	45.76	.7	45.99
.3	45.31	.8	45.54	.3	45.77	.8	45.99
.4	45.32	.9	45.55	.4	45.77	.9	46.00
.5	45.33	703.0	45.55	.5	45.78	710.0	46.01



710.1—724.0

46.01—46.91

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
710.1	46.01	713.6	46.24	717.1	46.47	720.6	46.69
.2	46.02	.7	46.25	.2	46.47	.7	46.70
.3	46.03	.8	46.25	.3	46.48	.8	46.71
.4	46.03	.9	46.26	.4	46.49	.9	46.71
.5	46.04	714.0	46.27	.5	46.49	721.0	46.72
.6	46.05	.1	46.27	.6	46.50	.1	46.73
.7	46.05	.2	46.28	.7	46.51	.2	46.73
.8	46.06	.3	46.29	.8	46.51	.3	46.74
.9	46.07	.4	46.29	.9	46.52	.4	46.75
711.0	46.07	.5	46.30	718.0	46.53	.5	46.75
.1	46.08	.6	46.31	.1	46.53	.6	46.76
.2	46.09	.7	46.31	.2	46.54	.7	46.77
.3	46.09	.8	46.32	.3	46.55	.8	46.77
.4	46.10	.9	46.33	.4	46.55	.9	46.78
.5	46.10	715.0	46.33	.5	46.56	722.0	46.79
.6	46.11	.1	46.34	.6	46.57	.1	46.79
.7	46.12	.2	46.34	.7	46.57	.2	46.80
.8	46.12	.3	46.35	.8	46.58	.3	46.80
.9	46.13	.4	46.36	.9	46.58	.4	46.81
712.0	46.14	.5	46.36	719.0	46.59	.5	46.82
.1	46.14	.6	46.37	.1	46.60	.6	46.82
.2	46.15	.7	46.38	.2	46.60	.7	46.83
.3	46.16	.8	46.38	.3	46.61	.8	46.84
.4	46.16	.9	46.39	.4	46.62	.9	46.84
.5	46.17	716.0	46.40	.5	46.62	723.0	46.85
.6	46.18	.1	46.40	.6	46.63	.1	46.86
.7	46.18	.2	46.41	.7	46.64	.2	46.86
.8	46.19	.3	46.42	.8	46.64	.3	46.87
.9	46.20	.4	46.42	.9	46.65	.4	46.88
713.0	46.20	.5	46.43	720.0	46.66	.5	46.88
.1	46.21	.6	46.44	.1	46.66	.6	46.89
.2	46.22	.7	46.44	.2	46.67	.7	46.90
.3	46.22	.8	46.45	.3	46.68	.8	46.90
.4	46.23	.9	46.45	.4	46.68	.9	46.91
.5	46.23	717.0	46.46	.5	46.69	724.0	46.91

Decimal Grains to Grams

53

724.1—738.0

46.92—47.82

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
724.1	46.92	727.6	47.15	731.1	47.38	734.6	47.60
.2	46.93	.7	47.15	.2	47.38	.7	47.61
.3	46.93	.8	47.16	.3	47.39	.8	47.61
.4	46.94	.9	47.17	.4	47.39	.9	47.62
.5	46.95	728.0	47.17	.5	47.40	735.0	47.63
.6	46.95	.1	47.18	.6	47.41	.1	47.63
.7	46.96	.2	47.19	.7	47.41	.2	47.64
.8	46.97	.3	47.19	.8	47.42	.3	47.65
.9	46.97	.4	47.20	.9	47.43	.4	47.65
725.0	46.98	.5	47.21	732.0	47.43	.5	47.66
.1	46.99	.6	47.21	.1	47.44	.6	47.67
.2	46.99	.7	47.22	.2	47.45	.7	47.67
.3	47.00	.8	47.23	.3	47.45	.8	47.68
.4	47.01	.9	47.23	.4	47.46	.9	47.69
.5	47.01	729.0	47.24	.5	47.47	736.0	47.69
.6	47.02	.1	47.25	.6	47.47	.1	47.70
.7	47.03	.2	47.25	.7	47.48	.2	47.71
.8	47.03	.3	47.26	.8	47.49	.3	47.71
.9	47.04	.4	47.26	.9	47.49	.4	47.72
726.0	47.04	.5	47.27	733.0	47.50	.5	47.72
.1	47.05	.6	47.28	.1	47.50	.6	47.73
.2	47.06	.7	47.28	.2	47.51	.7	47.74
.3	47.06	.8	47.29	.3	47.52	.8	47.74
.4	47.07	.9	47.30	.4	47.52	.9	47.75
.5	47.08	730.0	47.30	.5	47.53	737.0	47.76
.6	47.08	.1	47.31	.6	47.54	.1	47.76
.7	47.09	.2	47.32	.7	47.54	.2	47.77
.8	47.10	.3	47.32	.8	47.55	.3	47.78
.9	47.10	.4	47.33	.9	47.56	.4	47.78
727.0	47.11	.5	47.34	734.0	47.56	.5	47.79
.1	47.12	.6	47.34	.1	47.57	.6	47.80
.2	47.12	.7	47.35	.2	47.58	.7	47.80
.3	47.13	.8	47.36	.3	47.58	.8	47.81
.4	47.14	.9	47.36	.4	47.59	.9	47.82
.5	47.14	731.0	47.37	.5	47.60	738.0	47.82

738.1—752.0

47.83—48.73

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
738.1	47.83	741.6	48.06	745.1	48.28	748.6	48.51
.2	47.84	.7	48.06	.2	48.29	.7	48.52
.3	47.84	.8	48.07	.3	48.30	.8	48.52
.4	47.85	.9	48.07	.4	48.30	.9	48.53
.5	47.85	742.0	48.08	.5	48.31	749.0	48.53
.6	47.86	.1	48.09	.6	48.31	.1	48.54
.7	47.87	.2	48.09	.7	48.32	.2	48.55
.8	47.87	.3	48.10	.8	48.33	.3	48.55
.9	47.88	.4	48.11	.9	48.33	.4	48.56
739.0	47.89	.5	48.11	746.0	48.34	.5	48.57
.1	47.89	.6	48.12	.1	48.35	.6	48.57
.2	47.90	.7	48.13	.2	48.35	.7	48.58
.3	47.91	.8	48.13	.3	48.36	.8	48.59
.4	47.91	.9	48.14	.4	48.37	.9	48.59
.5	47.92	743.0	48.15	.5	48.37	750.0	48.60
.6	47.93	.1	48.15	.6	48.38	.1	48.61
.7	47.93	.2	48.16	.7	48.39	.2	48.61
.8	47.94	.3	48.17	.8	48.39	.3	48.62
.9	47.95	.4	48.17	.9	48.40	.4	48.63
740.0	47.95	.5	48.18	747.0	48.41	.5	48.63
.1	47.96	.6	48.18	.1	48.41	.6	48.64
.2	47.96	.7	48.19	.2	48.42	.7	48.65
.3	47.97	.8	48.20	.3	48.42	.8	48.65
.4	47.98	.9	48.20	.4	48.43	.9	48.66
.5	47.98	744.0	48.21	.5	48.44	751.0	48.66
.6	47.99	.1	48.22	.6	48.44	.1	48.67
.7	48.00	.2	48.22	.7	48.45	.2	48.68
.8	48.00	.3	48.23	.8	48.46	.3	48.68
.9	48.01	.4	48.24	.9	48.46	.4	48.69
741.0	48.02	.5	48.24	748.0	48.47	.5	48.70
.1	48.02	.6	48.25	.1	48.48	.6	48.70
.2	48.03	.7	48.26	.2	48.48	.7	48.71
.3	48.04	.8	48.26	.3	48.49	.8	48.72
.4	48.04	.9	48.27	.4	48.50	.9	48.72
.5	48.05	745.0	48.28	.5	48.50	752.0	48.73

Decimal Grains to Grams

55

752.1—766.0

48.74—49.64

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
752.1	48.74	755.6	48.96	759.1	49.19	762.6	49.42
.2	48.74	.7	48.97	.2	49.20	.7	49.42
.3	48.75	.8	48.98	.3	49.20	.8	49.43
.4	48.76	.9	48.98	.4	49.21	.9	49.44
.5	48.76	756.0	48.99	.5	49.22	763.0	49.44
.6	48.77	.1	48.99	.6	49.22	.1	49.45
.7	48.77	.2	49.00	.7	49.23	.2	49.46
.8	48.78	.3	49.01	.8	49.23	.3	49.46
.9	48.79	.4	49.01	.9	49.24	.4	49.47
753.0	48.79	.5	49.02	760.0	49.25	.5	49.47
.1	48.80	.6	49.03	.1	49.25	.6	49.48
.2	48.81	.7	49.03	.2	49.26	.7	49.49
.3	48.81	.8	49.04	.3	49.27	.8	49.49
.4	48.82	.9	49.05	.4	49.27	.9	49.50
.5	48.83	757.0	49.05	.5	49.28	764.0	49.51
.6	48.83	.1	49.06	.6	49.29	.1	49.51
.7	48.84	.2	49.07	.7	49.29	.2	49.52
.8	48.85	.3	49.07	.8	49.30	.3	49.53
.9	48.85	.4	49.08	.9	49.31	.4	49.53
754.0	48.86	.5	49.09	761.0	49.31	.5	49.54
.1	48.87	.6	49.09	.1	49.32	.6	49.55
.2	48.87	.7	49.10	.2	49.33	.7	49.55
.3	48.88	.8	49.11	.3	49.33	.8	49.56
.4	48.88	.9	49.11	.4	49.34	.9	49.57
.5	48.89	758.0	49.12	.5	49.34	765.0	49.57
.6	48.90	.1	49.12	.6	49.35	.1	49.58
.7	48.90	.2	49.13	.7	49.36	.2	49.58
.8	48.91	.3	49.14	.8	49.36	.3	49.59
.9	48.92	.4	49.14	.9	49.37	.4	49.60
755.0	48.92	.5	49.15	762.0	49.38	.5	49.60
.1	48.93	.6	49.16	.1	49.38	.6	49.61
.2	48.94	.7	49.16	.2	49.39	.7	49.62
.3	48.94	.8	49.17	.3	49.40	.8	49.62
.4	48.95	.9	49.18	.4	49.40	.9	49.63
.5	48.96	759.0	49.18	.5	49.41	766.0	49.64

766.1—780.0

49.64—50.54

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
766.1	49.64	769.6	49.87	773.1	50.10	776.6	50.32
.2	49.65	.7	49.88	.2	50.10	.7	50.33
.3	49.66	.8	49.88	.3	50.11	.8	50.34
.4	49.66	.9	49.89	.4	50.12	.9	50.34
.5	49.67	770.0	49.90	.5	50.12	777.0	50.35
.6	49.68	.1	49.90	.6	50.13	.1	50.36
.7	49.68	.2	49.91	.7	50.14	.2	50.36
.8	49.69	.3	49.92	.8	50.14	.3	50.37
.9	49.69	.4	49.92	.9	50.15	.4	50.38
767.0	49.70	.5	49.93	774.0	50.15	.5	50.38
.1	49.71	.6	49.93	.1	50.16	.6	50.39
.2	49.71	.7	49.94	.2	50.17	.7	50.39
.3	49.72	.8	49.95	.3	50.17	.8	50.40
.4	49.73	.9	49.95	.4	50.18	.9	50.41
.5	49.73	771.0	49.96	.5	50.19	778.0	50.41
.6	49.74	.1	49.97	.6	50.19	.1	50.42
.7	49.75	.2	49.97	.7	50.20	.2	50.43
.8	49.75	.3	49.98	.8	50.21	.3	50.43
.9	49.76	.4	49.99	.9	50.21	.4	50.44
768.0	49.77	.5	49.99	775.0	50.22	.5	50.45
.1	49.77	.6	50.00	.1	50.23	.6	50.45
.2	49.78	.7	50.01	.2	50.23	.7	50.46
.3	49.79	.8	50.01	.3	50.24	.8	50.47
.4	49.79	.9	50.02	.4	50.25	.9	50.47
.5	49.80	772.0	50.03	.5	50.25	779.0	50.48
.6	49.80	.1	50.03	.6	50.26	.1	50.49
.7	49.81	.2	50.04	.7	50.27	.2	50.49
.8	49.82	.3	50.04	.8	50.27	.3	50.50
.9	49.82	.4	50.05	.9	50.28	.4	50.50
769.0	49.83	.5	50.06	776.0	50.28	.5	50.51
.1	49.84	.6	50.06	.1	50.29	.6	50.52
.2	49.84	.7	50.07	.2	50.30	.7	50.52
.3	49.85	.8	50.08	.3	50.30	.8	50.53
.4	49.86	.9	50.08	.4	50.31	.9	50.54
.5	49.86	773.0	50.09	.5	50.32	780.0	50.54

780.1—794.0

50.55—51.45

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
780.1	50.55	783.6	50.78	787.1	51.00	790.6	51.23
.2	50.56	.7	50.78	.2	51.01	.7	51.24
.3	50.56	.8	50.79	.3	51.02	.8	51.24
.4	50.57	.9	50.80	.4	51.02	.9	51.25
.5	50.58	784.0	50.80	.5	51.03	791.0	51.26
.6	50.58	.1	50.81	.6	51.04	.1	51.26
.7	50.59	.2	50.82	.7	51.04	.2	51.27
.8	50.60	.3	50.82	.8	51.05	.3	51.28
.9	50.60	.4	50.83	.9	51.06	.4	51.28
781.0	50.61	.5	50.84	788.0	51.06	.5	51.29
.1	50.61	.6	50.84	.1	51.07	.6	51.30
.2	50.62	.7	50.85	.2	51.07	.7	51.30
.3	50.63	.8	50.85	.3	51.08	.8	51.31
.4	50.63	.9	50.86	.4	51.09	.9	51.31
.5	50.64	785.0	50.87	.5	51.09	792.0	51.32
.6	50.65	.1	50.87	.6	51.10	.1	51.33
.7	50.65	.2	50.88	.7	51.11	.2	51.33
.8	50.66	.3	50.89	.8	51.11	.3	51.34
.9	50.67	.4	50.89	.9	51.12	.4	51.35
782.0	50.67	.5	50.90	789.0	51.13	.5	51.35
.1	50.68	.6	50.91	.1	51.13	.6	51.36
.2	50.69	.7	50.91	.2	51.14	.7	51.37
.3	50.69	.8	50.92	.3	51.15	.8	51.37
.4	50.70	.9	50.93	.4	51.15	.9	51.38
.5	50.71	786.0	50.93	.5	51.16	793.0	51.39
.6	50.71	.1	50.94	.6	51.17	.1	51.39
.7	50.72	.2	50.95	.7	51.17	.2	51.40
.8	50.73	.3	50.95	.8	51.18	.3	51.41
.9	50.73	.4	50.96	.9	51.19	.4	51.41
783.0	50.74	.5	50.96	790.0	51.19	.5	51.42
.1	50.74	.6	50.97	.1	51.20	.6	51.42
.2	50.75	.7	50.98	.2	51.20	.7	51.43
.3	50.76	.8	50.98	.3	51.21	.8	51.44
.4	50.76	.9	50.99	.4	51.22	.9	51.44
.5	50.77	787.0	51.00	.5	51.22	794.0	51.45

794.1—808.0

51.46—52.36

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
794.1	51.46	797.6	51.68	801.1	51.91	804.6	52.14
.2	51.46	.7	51.69	.2	51.92	.7	52.14
.3	51.47	.8	51.70	.3	51.92	.8	52.15
.4	51.48	.9	51.70	.4	51.93	.9	52.16
.5	51.48	798.0	51.71	.5	51.94	805.0	52.16
.6	51.49	.1	51.72	.6	51.94	.1	52.17
.7	51.50	.2	51.72	.7	51.95	.2	52.18
.8	51.50	.3	51.73	.8	51.96	.3	52.18
.9	51.51	.4	51.74	.9	51.96	.4	52.19
795.0	51.52	.5	51.74	802.0	51.97	.5	52.20
.1	51.52	.6	51.75	.1	51.98	.6	52.20
.2	51.53	.7	51.76	.2	51.98	.7	52.21
.3	51.54	.8	51.76	.3	51.99	.8	52.22
.4	51.54	.9	51.77	.4	52.00	.9	52.22
.5	51.55	799.0	51.77	.5	52.00	806.0	52.23
.6	51.55	.1	51.78	.6	52.01	.1	52.23
.7	51.56	.2	51.79	.7	52.01	.2	52.24
.8	51.57	.3	51.79	.8	52.02	.3	52.25
.9	51.57	.4	51.80	.9	52.03	.4	52.25
796.0	51.58	.5	51.81	803.0	52.03	.5	52.26
.1	51.59	.6	51.81	.1	52.04	.6	52.27
.2	51.59	.7	51.82	.2	52.05	.7	52.27
.3	51.60	.8	51.83	.3	52.05	.8	52.28
.4	51.61	.9	51.83	.4	52.06	.9	52.29
.5	51.61	800.0	51.84	.5	52.07	807.0	52.29
.6	51.62	.1	51.85	.6	52.07	.1	52.30
.7	51.63	.2	51.85	.7	52.08	.2	52.31
.8	51.63	.3	51.86	.8	52.09	.3	52.31
.9	51.64	.4	51.87	.9	52.09	.4	52.32
797.0	51.65	.5	51.87	804.0	52.10	.5	52.33
.1	51.65	.6	51.88	.1	52.11	.6	52.33
.2	51.66	.7	51.89	.2	52.11	.7	52.34
.3	51.66	.8	51.89	.3	52.12	.8	52.35
.4	51.67	.9	51.90	.4	52.12	.9	52.35
.5	51.68	801.0	51.90	.5	52.13	808.0	52.36

Decimal Grains to Grams

59

808.1—822.0

52.36—53.27

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
808.1	52.36	811.6	52.59	815.1	52.82	818.6	53.04
.2	52.37	.7	52.60	.2	52.82	.7	53.05
.3	52.38	.8	52.60	.3	52.83	.8	53.06
.4	52.38	.9	52.61	.4	52.84	.9	53.06
.5	52.39	812.0	52.62	.5	52.84	819.0	53.07
.6	52.40	.1	52.62	.6	52.85	.1	53.08
.7	52.40	.2	52.63	.7	52.86	.2	53.08
.8	52.41	.3	52.64	.8	52.86	.3	53.09
.9	52.42	.4	52.64	.9	52.87	.4	53.10
809.0	52.42	.5	52.65	816.0	52.88	.5	53.10
.1	52.43	.6	52.66	.1	52.88	.6	53.11
.2	52.44	.7	52.66	.2	52.89	.7	53.12
.3	52.44	.8	52.67	.3	52.90	.8	53.12
.4	52.45	.9	52.68	.4	52.90	.9	53.13
.5	52.46	813.0	52.68	.5	52.91	820.0	53.14
.6	52.46	.1	52.69	.6	52.92	.1	53.14
.7	52.47	.2	52.70	.7	52.92	.2	53.15
.8	52.47	.3	52.70	.8	52.93	.3	53.16
.9	52.48	.4	52.71	.9	52.93	.4	53.16
810.0	52.49	.5	52.71	817.0	52.94	.5	53.17
.1	52.49	.6	52.72	.1	52.95	.6	53.17
.2	52.50	.7	52.73	.2	52.95	.7	53.18
.3	52.51	.8	52.73	.3	52.96	.8	53.19
.4	52.51	.9	52.74	.4	52.97	.9	53.19
.5	52.52	814.0	52.75	.5	52.97	821.0	53.20
.6	52.53	.1	52.75	.6	52.98	.1	53.21
.7	52.53	.2	52.76	.7	52.99	.2	53.21
.8	52.54	.3	52.77	.8	52.99	.3	53.22
.9	52.55	.4	52.77	.9	53.00	.4	53.23
811.0	52.55	.5	52.78	818.0	53.01	.5	53.23
.1	52.56	.6	52.79	.1	53.01	.6	53.24
.2	52.57	.7	52.79	.2	53.02	.7	53.25
.3	52.57	.8	52.80	.3	53.03	.8	53.25
.4	52.58	.9	52.81	.4	53.03	.9	53.26
.5	52.58	815.0	52.81	.5	53.04	822.0	53.27



822.1—836.0

53.27—54.17

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
822.1	53.27	825.6	53.50	829.1	53.73	832.6	53.95
.2	53.28	.7	53.50	.2	53.73	.7	53.96
.3	53.28	.8	53.51	.3	53.74	.8	53.97
.4	53.29	.9	53.52	.4	53.74	.9	53.97
.5	53.30	826.0	53.52	.5	53.75	833.0	53.98
.6	53.30	.1	53.53	.6	53.76	.1	53.98
.7	53.31	.2	53.54	.7	53.76	.2	53.99
.8	53.32	.3	53.54	.8	53.77	.3	54.00
.9	53.32	.4	53.55	.9	53.78	.4	54.00
823.0	53.33	.5	53.56	830.0	53.78	.5	54.01
.1	53.34	.6	53.56	.1	53.79	.6	54.02
.2	53.34	.7	53.57	.2	53.80	.7	54.02
.3	53.35	.8	53.58	.3	53.80	.8	54.03
.4	53.36	.9	53.58	.4	53.81	.9	54.04
.5	53.36	827.0	53.59	.5	53.82	834.0	54.04
.6	53.37	.1	53.60	.6	53.82	.1	54.05
.7	53.38	.2	53.60	.7	53.83	.2	54.06
.8	53.38	.3	53.61	.8	53.84	.3	54.06
.9	53.39	.4	53.62	.9	53.84	.4	54.07
824.0	53.39	.5	53.62	831.0	53.85	.5	54.08
.1	53.40	.6	53.63	.1	53.85	.6	54.08
.2	53.41	.7	53.63	.2	53.86	.7	54.09
.3	53.41	.8	53.64	.3	53.87	.8	54.09
.4	53.42	.9	53.65	.4	53.87	.9	54.10
.5	53.43	828.0	53.65	.5	53.88	835.0	54.11
.6	53.43	.1	53.66	.6	53.89	.1	54.11
.7	53.44	.2	53.67	.7	53.89	.2	54.12
.8	53.45	.3	53.67	.8	53.90	.3	54.13
.9	53.45	.4	53.68	.9	53.91	.4	54.13
825.0	53.46	.5	53.69	832.0	53.91	.5	54.14
.1	53.47	.6	53.69	.1	53.92	.6	54.15
.2	53.47	.7	53.70	.2	53.93	.7	54.15
.3	53.48	.8	53.71	.3	53.93	.8	54.16
.4	53.49	.9	53.71	.4	53.94	.9	54.17
.5	53.49	829.0	53.72	.5	53.95	836.0	54.17

Decimal Grains to Grams

61

836.1—850.0

54.18—55.08

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
836.1	54.18	839.6	54.41	843.1	54.63	846.6	54.86
.2	54.19	.7	54.41	.2	54.64	.7	54.87
.3	54.19	.8	54.42	.3	54.65	.8	54.87
.4	54.20	.9	54.43	.4	54.65	.9	54.88
.5	54.20	840.0	54.43	.5	54.66	847.0	54.89
.6	54.21	.1	54.44	.6	54.66	.1	54.89
.7	54.22	.2	54.44	.7	54.67	.2	54.90
.8	54.22	.3	54.45	.8	54.68	.3	54.90
.9	54.23	.4	54.46	.9	54.68	.4	54.91
837.0	54.24	.5	54.46	844.0	54.69	.5	54.92
.1	54.24	.6	54.47	.1	54.69	.6	54.92
.2	54.25	.7	54.48	.2	54.70	.7	54.93
.3	54.26	.8	54.48	.3	54.71	.8	54.94
.4	54.26	.9	54.49	.4	54.71	.9	54.94
.5	54.27	841.0	54.50	.5	54.72	848.0	54.95
.6	54.28	.1	54.50	.6	54.73	.1	54.96
.7	54.28	.2	54.51	.7	54.73	.2	54.96
.8	54.29	.3	54.52	.8	54.74	.3	54.97
.9	54.30	.4	54.52	.9	54.75	.4	54.98
838.0	54.30	.5	54.53	845.0	54.76	.5	54.98
.1	54.31	.6	54.54	.1	54.76	.6	54.99
.2	54.31	.7	54.54	.2	54.77	.7	55.00
.3	54.32	.8	54.55	.3	54.78	.8	55.00
.4	54.33	.9	54.55	.4	54.78	.9	55.01
.5	54.33	842.0	54.56	.5	54.79	849.0	55.01
.6	54.34	.1	54.57	.6	54.79	.1	55.02
.7	54.35	.2	54.57	.7	54.80	.2	55.03
.8	54.35	.3	54.58	.8	54.81	.3	55.03
.9	54.36	.4	54.59	.9	54.81	.4	55.04
839.0	54.37	.5	54.59	846.0	54.82	.5	55.05
.1	54.37	.6	54.60	.1	54.83	.6	55.05
.2	54.38	.7	54.61	.2	54.83	.7	55.06
.3	54.39	.8	54.61	.3	54.84	.8	55.07
.4	54.39	.9	54.62	.4	54.85	.9	55.07
.5	54.40	843.0	54.63	.5	54.85	850.0	55.08

850.1—864.0

55.09—55.99

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
850.1	55.09	853.6	55.31	857.1	55.54	860.6	55.77
.2	55.09	.7	55.32	.2	55.55	.7	55.77
.3	55.10	.8	55.33	.3	55.55	.8	55.78
.4	55.11	.9	55.33	.4	55.56	.9	55.79
.5	55.11	854.0	55.34	.5	55.57	861.0	55.79
.6	55.12	.1	55.35	.6	55.57	.1	55.80
.7	55.12	.2	55.35	.7	55.58	.2	55.81
.8	55.13	.3	55.36	.8	55.59	.3	55.81
.9	55.14	.4	55.36	.9	55.59	.4	55.82
851.0	55.14	.5	55.37	858.0	55.60	.5	55.82
.1	55.15	.6	55.38	.1	55.60	.6	55.83
.2	55.16	.7	55.38	.2	55.61	.7	55.84
.3	55.16	.8	55.39	.3	55.62	.8	55.84
.4	55.17	.9	55.40	.4	55.62	.9	55.85
.5	55.18	855.0	55.40	.5	55.63	862.0	55.86
.6	55.18	.1	55.41	.6	55.64	.1	55.86
.7	55.19	.2	55.42	.7	55.64	.2	55.87
.8	55.20	.3	55.42	.8	55.65	.3	55.88
.9	55.20	.4	55.43	.9	55.66	.4	55.88
852.0	55.21	.5	55.44	859.0	55.66	.5	55.89
.1	55.22	.6	55.44	.1	55.67	.6	55.90
.2	55.22	.7	55.45	.2	55.68	.7	55.90
.3	55.23	.8	55.46	.3	55.68	.8	55.91
.4	55.24	.9	55.46	.4	55.69	.9	55.92
.5	55.24	856.0	55.47	.5	55.70	863.0	55.92
.6	55.25	.1	55.47	.6	55.70	.1	55.93
.7	55.25	.2	55.48	.7	55.71	.2	55.93
.8	55.26	.3	55.49	.8	55.71	.3	55.94
.9	55.27	.4	55.49	.9	55.72	.4	55.95
853.0	55.27	.5	55.50	860.0	55.73	.5	55.95
.1	55.28	.6	55.51	.1	55.73	.6	55.96
.2	55.29	.7	55.51	.2	55.74	.7	55.97
.3	55.29	.8	55.52	.3	55.75	.8	55.97
.4	55.30	.9	55.53	.4	55.75	.9	55.98
.5	55.31	857.0	55.53	.5	55.76	864.0	55.99

Decimal Grains to Grams

63

864.1—878.0

55.99—56.89

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
864.1	55.99	867.6	56.22	871.1	56.45	874.6	56.67
.2	56.00	.7	56.23	.2	56.45	.7	56.68
.3	56.01	.8	56.23	.3	56.46	.8	56.69
.4	56.01	.9	56.24	.4	56.47	.9	56.69
.5	56.02	868.0	56.25	.5	56.47	875.0	56.70
.6	56.03	.1	56.25	.6	56.48	.1	56.71
.7	56.03	.2	56.26	.7	56.49	.2	56.71
.8	56.04	.3	56.27	.8	56.49	.3	56.72
.9	56.05	.4	56.27	.9	56.50	.4	56.73
865.0	56.05	.5	56.28	872.0	56.51	.5	56.73
.1	56.06	.6	56.28	.1	56.51	.6	56.74
.2	56.06	.7	56.29	.2	56.52	.7	56.74
.3	56.07	.8	56.30	.3	56.52	.8	56.75
.4	56.08	.9	56.30	.4	56.53	.9	56.76
.5	56.08	869.0	56.31	.5	56.54	876.0	56.76
.6	56.09	.1	56.32	.6	56.54	.1	56.77
.7	56.10	.2	56.32	.7	56.55	.2	56.78
.8	56.10	.3	56.33	.8	56.56	.3	56.78
.9	56.11	.4	56.34	.9	56.56	.4	56.79
866.0	56.12	.5	56.34	873.0	56.57	.5	56.80
.1	56.12	.6	56.35	.1	56.58	.6	56.80
.2	56.13	.7	56.36	.2	56.58	.7	56.81
.3	56.14	.8	56.36	.3	56.59	.8	56.82
.4	56.14	.9	56.37	.4	56.60	.9	56.82
.5	56.15	870.0	56.38	.5	56.60	877.0	56.83
.6	56.16	.1	56.38	.6	56.61	.1	56.84
.7	56.16	.2	56.39	.7	56.62	.2	56.84
.8	56.17	.3	56.40	.8	56.62	.3	56.85
.9	56.17	.4	56.40	.9	56.63	.4	56.86
867.0	56.18	.5	56.41	874.0	56.63	.5	56.86
.1	56.19	.6	56.41	.1	56.64	.6	56.87
.2	56.19	.7	56.42	.2	56.65	.7	56.87
.3	56.20	.8	56.43	.3	56.65	.8	56.88
.4	56.21	.9	56.43	.4	56.66	.9	56.89
.5	56.21	871.0	56.44	.5	56.67	878.0	56.89

878.1—892.0

56.90—57.80

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
878.1	56.90	881.6	57.13	885.1	57.35	888.6	57.58
.2	56.91	.7	57.13	.2	57.36	.7	57.59
.3	56.91	.8	57.14	.3	57.37	.8	57.59
.4	56.92	.9	57.15	.4	57.37	.9	57.60
.5	56.93	882.0	57.15	.5	57.38	889.0	57.61
.6	56.93	.1	57.16	.6	57.39	.1	57.61
.7	56.94	.2	57.17	.7	57.39	.2	57.62
.8	56.95	.3	57.17	.8	57.40	.3	57.63
.9	56.95	.4	57.18	.9	57.41	.4	57.63
879.0	56.96	.5	57.19	886.0	57.41	.5	57.64
.1	56.97	.6	57.19	.1	57.42	.6	57.65
.2	56.97	.7	57.20	.2	57.43	.7	57.65
.3	56.98	.8	57.20	.3	57.43	.8	57.66
.4	56.98	.9	57.21	.4	57.44	.9	57.67
.5	56.99	883.0	57.22	.5	57.44	890.0	57.67
.6	57.00	.1	57.22	.6	57.45	.1	57.68
.7	57.00	.2	57.23	.7	57.46	.2	57.68
.8	57.01	.3	57.24	.8	57.46	.3	57.69
.9	57.02	.4	57.24	.9	57.47	.4	57.70
880.0	57.02	.5	57.25	887.0	57.48	.5	57.70
.1	57.03	.6	57.26	.1	57.48	.6	57.71
.2	57.04	.7	57.26	.2	57.49	.7	57.72
.3	57.04	.8	57.27	.3	57.50	.8	57.72
.4	57.05	.9	57.28	.4	57.50	.9	57.73
.5	57.06	884.0	57.28	.5	57.51	891.0	57.74
.6	57.06	.1	57.29	.6	57.52	.1	57.74
.7	57.07	.2	57.30	.7	57.52	.2	57.75
.8	57.08	.3	57.30	.8	57.53	.3	57.76
.9	57.08	.4	57.31	.9	57.54	.4	57.76
881.0	57.09	.5	57.32	888.0	57.54	.5	57.77
.1	57.09	.6	57.32	.1	57.55	.6	57.78
.2	57.10	.7	57.33	.2	57.55	.7	57.78
.3	57.11	.8	57.33	.3	57.56	.8	57.79
.4	57.11	.9	57.34	.4	57.57	.9	57.79
.5	57.12	885.0	57.35	.5	57.57	892.0	57.80

Decimal Grains to Grams

65

892.1—906.0

57.81—58.71

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
892.1	57.81	895.6	58.03	899.1	58.26	902.6	58.49
.2	57.81	.7	58.04	.2	58.27	.7	58.49
.3	57.82	.8	58.05	.3	58.27	.8	58.50
.4	57.83	.9	58.05	.4	58.28	.9	58.51
.5	57.83	896.0	58.06	.5	58.29	903.0	58.51
.6	57.84	.1	58.07	.6	58.29	.1	58.52
.7	57.84	.2	58.07	.7	58.30	.2	58.53
.8	57.85	.3	58.08	.8	58.31	.3	58.53
.9	57.86	.4	58.09	.9	58.31	.4	58.54
893.0	57.87	.5	58.09	900.0	58.32	.5	58.55
.1	57.87	.6	58.10	.1	58.33	.6	58.56
.2	57.88	.7	58.11	.2	58.33	.7	58.56
.3	57.89	.8	58.11	.3	58.34	.8	58.57
.4	57.89	.9	58.12	.4	58.34	.9	58.57
.5	57.90	897.0	58.13	.5	58.35	904.0	58.58
.6	57.90	.1	58.13	.6	58.36	.1	58.58
.7	57.91	.2	58.14	.7	58.36	.2	58.59
.8	57.92	.3	58.14	.8	58.37	.3	58.60
.9	57.92	.4	58.15	.9	58.38	.4	58.60
894.0	57.93	.5	58.16	901.0	58.38	.5	58.61
.1	57.94	.6	58.16	.1	58.39	.6	58.62
.2	57.94	.7	58.17	.2	58.40	.7	58.62
.3	57.95	.8	58.18	.3	58.40	.8	58.63
.4	57.96	.9	58.18	.4	58.41	.9	58.64
.5	57.96	898.0	58.19	.5	58.42	905.0	58.64
.6	57.97	.1	58.20	.6	58.42	.1	58.65
.7	57.98	.2	58.20	.7	58.43	.2	58.66
.8	57.98	.3	58.21	.8	58.44	.3	58.66
.9	57.99	.4	58.22	.9	58.44	.4	58.67
895.0	58.00	.5	58.22	902.0	58.45	.5	58.68
.1	58.00	.6	58.23	.1	58.46	.6	58.68
.2	58.01	.7	58.24	.2	58.46	.7	58.69
.3	58.01	.8	58.24	.3	58.47	.8	58.69
.4	58.02	.9	58.25	.4	58.47	.9	58.70
.5	58.03	899.0	58.25	.5	58.48	906.0	58.71

906.1—920.0

58.71—59.62

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
906.1	58.71	909.6	58.94	913.1	59.17	916.6	59.40
.2	58.72	.7	58.95	.2	59.17	.7	59.40
.3	58.73	.8	58.95	.3	59.18	.8	59.41
.4	58.73	.9	58.96	.4	59.19	.9	59.41
.5	58.74	910.0	58.97	.5	59.19	917.0	59.42
.6	58.75	.1	58.97	.6	59.20	.1	59.43
.7	58.75	.2	58.98	.7	59.21	.2	59.43
.8	58.76	.3	58.99	.8	59.21	.3	59.44
.9	58.77	.4	58.99	.9	59.22	.4	59.45
907.0	58.77	.5	59.00	914.0	59.23	.5	59.45
.1	58.78	.6	59.01	.1	59.23	.6	59.46
.2	58.79	.7	59.01	.2	59.24	.7	59.47
.3	58.79	.8	59.02	.3	59.25	.8	59.47
.4	58.80	.9	59.03	.4	59.25	.9	59.48
.5	58.80	911.0	59.03	.5	59.26	918.0	59.49
.6	58.81	.1	59.04	.6	59.27	.1	59.49
.7	58.82	.2	59.05	.7	59.27	.2	59.50
.8	58.82	.3	59.05	.8	59.28	.3	59.51
.9	58.83	.4	59.06	.9	59.29	.4	59.51
908.0	58.84	.5	59.06	915.0	59.29	.5	59.52
.1	58.84	.6	59.07	.1	59.30	.6	59.52
.2	58.85	.7	59.08	.2	59.30	.7	59.53
.3	58.86	.8	59.08	.3	59.31	.8	59.54
.4	58.86	.9	59.09	.4	59.32	.9	59.54
.5	58.87	912.0	59.10	.5	59.32	919.0	59.55
.6	58.88	.1	59.10	.6	59.33	.1	59.56
.7	58.88	.2	59.11	.7	59.34	.2	59.56
.8	58.89	.3	59.12	.8	59.34	.3	59.57
.9	58.90	.4	59.12	.9	59.35	.4	59.58
909.0	58.90	.5	59.13	916.0	59.36	.5	59.58
.1	58.91	.6	59.14	.1	59.36	.6	59.59
.2	58.92	.7	59.14	.2	59.37	.7	59.60
.3	58.92	.8	59.15	.3	59.38	.8	59.60
.4	58.93	.9	59.16	.4	59.38	.9	59.61
.5	58.93	913.0	59.16	.5	59.39	920.0	59.62

Decimal Grains to Grams

67

920.1—934.0

59.62—60.52

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
920.1	59.62	923.6	59.85	927.1	60.08	930.6	60.30
.2	59.63	.7	59.86	.2	60.08	.7	60.31
.3	59.63	.8	59.86	.3	60.09	.8	60.32
.4	59.64	.9	59.87	.4	60.10	.9	60.32
.5	59.65	924.0	59.87	.5	60.10	931.0	60.33
.6	59.65	.1	59.88	.6	60.11	.1	60.33
.7	59.66	.2	59.89	.7	60.11	.2	60.34
.8	59.67	.3	59.89	.8	60.12	.3	60.35
.9	59.67	.4	59.90	.9	60.13	.4	60.35
921.0	59.68	.5	59.91	928.0	60.13	.5	60.36
.1	59.69	.6	59.91	.1	60.14	.6	60.37
.2	59.69	.7	59.92	.2	60.15	.7	60.37
.3	59.70	.8	59.93	.3	60.15	.8	60.38
.4	59.71	.9	59.93	.4	60.16	.9	60.39
.5	59.71	925.0	59.94	.5	60.17	932.0	60.39
.6	59.72	.1	59.95	.6	60.17	.1	60.40
.7	59.73	.2	59.95	.7	60.18	.2	60.41
.8	59.73	.3	59.96	.8	60.19	.3	60.41
.9	59.74	.4	59.97	.9	60.19	.4	60.42
922.0	59.75	.5	59.97	929.0	60.20	.5	60.43
.1	59.75	.6	59.98	.1	60.21	.6	60.43
.2	59.76	.7	59.98	.2	60.21	.7	60.44
.3	59.76	.8	59.99	.3	60.22	.8	60.44
.4	59.77	.9	60.00	.4	60.22	.9	60.45
.5	59.78	926.0	60.00	.5	60.23	933.0	60.46
.6	59.78	.1	60.01	.6	60.24	.1	60.46
.7	59.79	.2	60.02	.7	60.24	.2	60.47
.8	59.80	.3	60.02	.8	60.25	.3	60.48
.9	59.80	.4	60.03	.9	60.26	.4	60.48
923.0	59.81	.5	60.04	930.0	60.26	.5	60.49
.1	59.82	.6	60.04	.1	60.27	.6	60.50
.2	59.82	.7	60.05	.2	60.28	.7	60.50
.3	59.83	.8	60.06	.3	60.28	.8	60.51
.4	59.84	.9	60.06	.4	60.29	.9	60.52
.5	59.84	927.0	60.07	.5	60.30	934.0	60.52

5•



934.1—948.0

60.53—61.43

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
934.1	60.53	937.6	60.76	941.1	60.98	944.6	61.21
.2	60.54	.7	60.76	.2	60.99	.7	61.22
.3	60.54	.8	60.77	.3	61.00	.8	61.22
.4	60.55	.9	60.78	.4	61.00	.9	61.23
.5	60.56	938.0	60.78	.5	61.01	945.0	61.24
.6	60.56	.1	60.79	.6	61.02	.1	61.24
.7	60.57	.2	60.79	.7	61.02	.2	61.25
.8	60.57	.3	60.80	.8	61.03	.3	61.25
.9	60.58	.4	60.81	.9	61.03	.4	61.26
935.0	60.59	.5	60.81	942.0	61.04	.5	61.27
.1	60.59	.6	60.82	.1	61.05	.6	61.27
.2	60.60	.7	60.83	.2	61.05	.7	61.28
.3	60.61	.8	60.83	.3	61.06	.8	61.29
.4	60.61	.9	60.84	.4	61.07	.9	61.29
.5	60.62	939.0	60.85	.5	61.07	946.0	61.30
.6	60.63	.1	60.85	.6	61.08	.1	61.31
.7	60.63	.2	60.86	.7	61.09	.2	61.31
.8	60.64	.3	60.87	.8	61.09	.3	61.32
.9	60.65	.4	60.87	.9	61.10	.4	61.33
936.0	60.65	.5	60.88	943.0	61.11	.5	61.33
.1	60.66	.6	60.89	.1	61.11	.6	61.34
.2	60.66	.7	60.89	.2	61.12	.7	61.35
.3	60.67	.8	60.90	.3	61.13	.8	61.35
.4	60.68	.9	60.91	.4	61.13	.9	61.36
.5	60.68	940.0	60.91	.5	61.14	947.0	61.37
.6	60.69	.1	60.92	.6	61.14	.1	61.37
.7	60.70	.2	60.92	.7	61.15	.2	61.38
.8	60.70	.3	60.93	.8	61.16	.3	61.38
.9	60.71	.4	60.94	.9	61.16	.4	61.39
937.0	60.72	.5	60.94	944.0	61.17	.5	61.40
.1	60.72	.6	60.95	.1	61.18	.6	61.40
.2	60.73	.7	60.96	.2	61.18	.7	61.41
.3	60.74	.8	60.96	.3	61.19	.8	61.42
.4	60.74	.9	60.97	.4	61.20	.9	61.42
.5	60.75	941.0	60.98	.5	61.20	948.0	61.43

Decimal Grains to Grams

69

948.1—962.0

61.44—62.34

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
948.1	61.44	951.6	61.66	955.1	61.89	958.6	62.12
.2	61.44	.7	61.67	.2	61.90	.7	62.12
.3	61.45	.8	61.68	.3	61.90	.8	62.13
.4	61.46	.9	61.68	.4	61.91	.9	62.14
.5	61.46	952.0	61.69	.5	61.92	959.0	62.14
.6	61.47	.1	61.70	.6	61.92	.1	62.15
.7	61.48	.2	61.70	.7	61.93	.2	62.16
.8	61.48	.3	61.71	.8	61.94	.3	62.16
.9	61.49	.4	61.72	.9	61.94	.4	62.17
949.0	61.49	.5	61.72	956.0	61.95	.5	62.18
.1	61.50	.6	61.73	.1	61.95	.6	62.18
.2	61.51	.7	61.73	.2	61.96	.7	62.19
.3	61.51	.8	61.74	.3	61.97	.8	62.19
.4	61.52	.9	61.75	.4	61.97	.9	62.20
.5	61.53	953.0	61.75	.5	61.98	960.0	62.21
.6	61.53	.1	61.76	.6	61.99	.1	62.21
.7	61.54	.2	61.77	.7	61.99	.2	62.22
.8	61.55	.3	61.77	.8	62.00	.3	62.23
.9	61.55	.4	61.78	.9	62.01	.4	62.23
950.0	61.56	.5	61.79	957.0	62.01	.5	62.24
.1	61.57	.6	61.79	.1	62.02	.6	62.25
.2	61.57	.7	61.80	.2	62.03	.7	62.25
.3	61.58	.8	61.81	.3	62.03	.8	62.26
.4	61.59	.9	61.81	.4	62.04	.9	62.27
.5	61.59	954.0	61.82	.5	62.05	961.0	62.27
.6	61.60	.1	61.83	.6	62.05	.1	62.28
.7	61.60	.2	61.83	.7	62.06	.2	62.29
.8	61.61	.3	61.84	.8	62.06	.3	62.29
.9	61.62	.4	61.84	.9	62.07	.4	62.30
951.0	61.62	.5	61.85	958.0	62.08	.5	62.30
.1	61.63	.6	61.86	.1	62.08	.6	62.31
.2	61.64	.7	61.86	.2	62.09	.7	62.32
.3	61.64	.8	61.87	.3	62.10	.8	62.32
.4	61.65	.9	61.88	.4	62.10	.9	62.33
.5	61.66	955.0	61.88	.5	62.11	962.0	62.34

962.1—976.0

62.34—63.24

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
962.1	62.34	965.6	62.57	969.1	62.80	972.6	63.02
.2	62.35	.7	62.58	.2	62.80	.7	63.03
.3	62.36	.8	62.58	.3	62.81	.8	63.04
.4	62.36	.9	62.59	.4	62.82	.9	63.04
.5	62.37	966.0	62.60	.5	62.82	973.0	63.05
.6	62.38	.1	62.60	.6	62.83	.1	63.06
.7	62.38	.2	62.61	.7	62.84	.2	63.06
.8	62.39	.3	62.62	.8	62.84	.3	63.07
.9	62.40	.4	62.62	.9	62.85	.4	63.08
963.0	62.40	.5	62.63	970.0	62.86	.5	63.08
.1	62.41	.6	62.64	.1	62.86	.6	63.09
.2	62.41	.7	62.64	.2	62.87	.7	63.10
.3	62.42	.8	62.65	.3	62.87	.8	63.10
.4	62.43	.9	62.65	.4	62.88	.9	63.11
.5	62.43	967.0	62.66	.5	62.89	974.0	63.11
.6	62.44	.1	62.67	.6	62.89	.1	63.12
.7	62.45	.2	62.67	.7	62.90	.2	63.13
.8	62.45	.3	62.68	.8	62.91	.3	63.13
.9	62.46	.4	62.69	.9	62.91	.4	63.14
964.0	62.47	.5	62.69	971.0	62.92	.5	63.15
.1	62.47	.6	62.70	.1	62.93	.6	63.15
.2	62.48	.7	62.71	.2	62.93	.7	63.16
.3	62.49	.8	62.71	.3	62.94	.8	63.17
.4	62.49	.9	62.72	.4	62.95	.9	63.17
.5	62.50	968.0	62.73	.5	62.95	975.0	63.18
.6	62.51	.1	62.73	.6	62.96	.1	63.19
.7	62.51	.2	62.74	.7	62.97	.2	63.19
.8	62.52	.3	62.75	.8	62.97	.3	63.20
.9	62.53	.4	62.75	.9	62.98	.4	63.21
965.0	62.53	.5	62.76	972.0	62.99	.5	63.21
.1	62.54	.6	62.76	.1	62.99	.6	63.22
.2	62.54	.7	62.77	.2	63.00	.7	63.23
.3	62.55	.8	62.78	.3	63.00	.8	63.23
.4	62.56	.9	62.78	.4	63.01	.9	63.24
.5	62.56	969.0	62.79	.5	63.02	976.0	63.24

Decimal Grains to Grams

71

976.1—990.0

63.25—64.15

Grains	Grams	Grains	Grams	Grains	Grams	Grains	Grams
976.1	63.25	979.6	63.48	983.1	63.70	986.6	63.93
.2	63.26	.7	63.48	.2	63.71	.7	63.94
.3	63.26	.8	63.49	.3	63.72	.8	63.94
.4	63.27	.9	63.50	.4	63.72	.9	63.95
.5	63.28	980.0	63.50	.5	63.73	987.0	63.96
.6	63.28	.1	63.51	.6	63.74	.1	63.96
.7	63.29	.2	63.52	.7	63.74	.2	63.97
.8	63.30	.3	63.52	.8	63.75	.3	63.98
.9	63.30	.4	63.53	.9	63.76	.4	63.98
977.0	63.31	.5	63.54	984.0	63.76	.5	63.99
.1	63.32	.6	63.54	.1	63.77	.6	64.00
.2	63.32	.7	63.55	.2	63.78	.7	64.00
.3	63.33	.8	63.56	.3	63.78	.8	64.01
.4	63.33	.9	63.56	.4	63.79	.9	64.02
.5	63.34	981.0	63.57	.5	63.80	988.0	64.02
.6	63.35	.1	63.57	.6	63.80	.1	64.03
.7	63.35	.2	63.58	.7	63.81	.2	64.03
.8	63.36	.3	63.59	.8	63.81	.3	64.04
.9	63.37	.4	63.59	.9	63.82	.4	64.05
978.0	63.37	.5	63.60	985.0	63.83	.5	64.05
.1	63.38	.6	63.61	.1	63.83	.6	64.06
.2	63.39	.7	63.61	.2	63.84	.7	64.07
.3	63.39	.8	63.62	.3	63.85	.8	64.07
.4	63.40	.9	63.63	.4	63.85	.9	64.08
.5	63.41	982.0	63.63	.5	63.86	989.0	64.09
.6	63.41	.1	63.64	.6	63.87	.1	64.09
.7	63.42	.2	63.65	.7	63.87	.2	64.10
.8	63.43	.3	63.65	.8	63.88	.3	64.11
.9	63.43	.4	63.66	.9	63.89	.4	64.11
979.0	63.44	.5	63.67	986.0	63.89	.5	64.12
.1	63.45	.6	63.67	.1	63.90	.6	64.13
.2	63.45	.7	63.68	.2	63.91	.7	64.13
.3	63.46	.8	63.68	.3	63.91	.8	64.14
.4	63.46	.9	63.69	.4	63.92	.9	64.14
.5	63.47	983.0	63.70	.5	63.92	990.0	64.15

990.1—1000.0

64.16—64.80

<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>	<i>Grains</i>	<i>Grams</i>
990.1	64.16	992.6	64.32	995.1	64.48	997.6	64.64
.2	64.16	.7	64.33	.2	64.49	.7	64.65
.3	64.17	.8	64.33	.3	64.49	.8	64.66
.4	64.18	.9	64.34	.4	64.50	.9	64.66
.5	64.18	993.0	64.35	.5	64.51	998.0	64.67
.6	64.19	.1	64.35	.6	64.51	.1	64.68
.7	64.20	.2	64.36	.7	64.52	.2	64.68
.8	64.20	.3	64.37	.8	64.53	.3	64.69
.9	64.21	.4	64.37	.9	64.53	.4	64.70
991.0	64.22	.5	64.38	996.0	64.54	.5	64.70
.1	64.22	.6	64.38	.1	64.55	.6	64.71
.2	64.23	.7	64.39	.2	64.55	.7	64.72
.3	64.24	.8	64.40	.3	64.56	.8	64.72
.4	64.24	.9	64.40	.4	64.57	.9	64.73
.5	64.25	994.0	64.41	.5	64.57	999.0	64.73
.6	64.26	.1	64.42	.6	64.58	.1	64.74
.7	64.26	.2	64.42	.7	64.59	.2	64.75
.8	64.27	.3	64.43	.8	64.59	.3	64.75
.9	64.27	.4	64.44	.9	64.60	.4	64.76
992.0	64.28	.5	64.44	997.0	64.61	.5	64.77
.1	64.29	.6	64.45	.1	64.61	.6	64.77
.2	64.29	.7	64.46	.2	64.62	.7	64.78
.3	64.30	.8	64.46	.3	64.62	.8	64.79
.4	64.31	.9	64.47	.4	64.63	.9	64.79
.5	64.31	995.0	64.48	.5	64.64	1000.0	64.80

TABLE II  
PENNYWEIGHTS AND GRAINS TO GRAMS

1.0—4.2

1.56—6.35

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
I	0	1.56	2	I	3.18	3	2	4.80
I	I	1.62	2	2	3.24	3	3	4.86
I	2	1.69	2	3	3.31	3	4	4.93
I	3	1.75	2	4	3.37	3	5	4.99
I	4	1.81	2	5	3.43	3	6	5.05
I	5	1.88	2	6	3.50	3	7	5.12
I	6	1.94	2	7	3.56	3	8	5.18
I	7	2.01	2	8	3.63	3	9	5.25
I	8	2.07	2	9	3.69	3	10	5.31
I	9	2.14	2	10	3.76	3	11	5.38
I	10	2.20	2	11	3.82	3	12	5.44
I	11	2.27	2	12	3.89	3	13	5.51
I	12	2.33	2	13	3.95	3	14	5.57
I	13	2.40	2	14	4.02	3	15	5.64
I	14	2.46	2	15	4.08	3	16	5.70
I	15	2.53	2	16	4.15	3	17	5.77
I	16	2.59	2	17	4.21	3	18	5.83
I	17	2.66	2	18	4.28	3	19	5.90
I	18	2.72	2	19	4.34	3	20	5.96
I	19	2.79	2	20	4.41	3	21	6.03
I	20	2.85	2	21	4.47	3	22	6.09
I	21	2.92	2	22	4.54	3	23	6.16
I	22	2.98	2	23	4.60	4	0	6.22
I	23	3.05	3	0	4.67	4	I	6.29
2	0	3.11	3	I	4.73	4	2	6.35

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
4	3	6.42	5	14	8.68	7	1	10.95
4	4	6.48	5	15	8.75	7	2	11.02
4	5	6.55	5	16	8.81	7	3	11.08
4	6	6.61	5	17	8.88	7	4	11.15
4	7	6.67	5	18	8.94	7	5	11.21
4	8	6.74	5	19	9.01	7	6	11.28
4	9	6.80	5	20	9.07	7	7	11.34
4	10	6.87	5	21	9.14	7	8	11.41
4	11	6.93	5	22	9.20	7	9	11.47
4	12	7.00	5	23	9.27	7	10	11.53
4	13	7.06	6	0	9.33	7	11	11.60
4	14	7.13	6	1	9.40	7	12	11.66
4	15	7.19	6	2	9.46	7	13	11.73
4	16	7.26	6	3	9.53	7	14	11.79
4	17	7.32	6	4	9.59	7	15	11.86
4	18	7.39	6	5	9.66	7	16	11.92
4	19	7.45	6	6	9.72	7	17	11.99
4	20	7.52	6	7	9.79	7	18	12.05
4	21	7.58	6	8	9.85	7	19	12.12
4	22	7.65	6	9	9.91	7	20	12.18
4	23	7.71	6	10	9.98	7	21	12.25
5	0	7.78	6	11	10.04	7	22	12.31
5	1	7.84	6	12	10.11	7	23	12.38
5	2	7.91	6	13	10.17	8	0	12.44
5	3	7.97	6	14	10.24	8	1	12.51
5	4	8.04	6	15	10.30	8	2	12.57
5	5	8.10	6	16	10.37	8	3	12.64
5	6	8.17	6	17	10.43	8	4	12.70
5	7	8.23	6	18	10.50	8	5	12.77
5	8	8.29	6	19	10.56	8	6	12.83
5	9	8.36	6	20	10.63	8	7	12.90
5	10	8.42	6	21	10.69	8	8	12.96
5	11	8.49	6	22	10.76	8	9	13.03
5	12	8.55	6	23	10.82	8	10	13.09
5	13	8.62	7	0	10.89	8	11	13.15

*Pennyweights and Grains to Grams*

75

8,12—12,20

13.22—19.96

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
8	12	13.22	9	23	15.49	11	10	17.76
8	13	13.28	10	0	15.55	11	11	17.82
8	14	13.35	10	1	15.62	11	12	17.89
8	15	13.41	10	2	15.68	11	13	17.95
8	16	13.48	10	3	15.75	11	14	18.01
8	17	13.54	10	4	15.81	11	15	18.08
8	18	13.61	10	5	15.88	11	16	18.14
8	19	13.67	10	6	15.94	11	17	18.21
8	20	13.74	10	7	16.01	11	18	18.27
8	21	13.80	10	8	16.07	11	19	18.34
8	22	13.87	10	9	16.14	11	20	18.40
8	23	13.93	10	10	16.20	11	21	18.47
9	0	14.00	10	11	16.27	11	22	18.53
9	1	14.06	10	12	16.33	11	23	18.60
9	2	14.13	10	13	16.39	12	0	18.66
9	3	14.19	10	14	16.46	12	1	18.73
9	4	14.26	10	15	16.52	12	2	18.79
9	5	14.32	10	16	16.59	12	3	18.86
9	6	14.39	10	17	16.65	12	4	18.92
9	7	14.45	10	18	16.72	12	5	18.99
9	8	14.52	10	19	16.78	12	6	19.05
9	9	14.58	10	20	16.85	12	7	19.12
9	10	14.65	10	21	16.91	12	8	19.18
9	11	14.71	10	22	16.98	12	9	19.25
9	12	14.77	10	23	17.04	12	10	19.31
9	13	14.84	11	0	17.11	12	11	19.38
9	14	14.90	11	1	17.17	12	12	19.44
9	15	14.97	11	2	17.24	12	13	19.51
9	16	15.03	11	3	17.30	12	14	19.57
9	17	15.10	11	4	17.37	12	15	19.63
9	18	15.16	11	5	17.43	12	16	19.70
9	19	15.23	11	6	17.50	12	17	19.76
9	20	15.29	11	7	17.56	12	18	19.83
9	21	15.36	11	8	17.63	12	19	19.89
9	22	15.42	11	9	17.69	12	20	19.96



12.21—17.5

20.02—26.76

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
12	21	20.02	14	8	22.29	15	19	24.56
12	22	20.09	14	9	22.36	15	20	24.62
12	23	20.15	14	10	22.42	15	21	24.69
13	0	20.22	14	11	22.49	15	22	24.75
13	1	20.28	14	12	22.55	15	23	24.82
13	2	20.35	14	13	22.62	16	0	24.88
13	3	20.41	14	14	22.68	16	1	24.95
13	4	20.48	14	15	22.75	16	2	25.01
13	5	20.54	14	16	22.81	16	3	25.08
13	6	20.61	14	17	22.87	16	4	25.14
13	7	20.67	14	18	22.94	16	5	25.21
13	8	20.74	14	19	23.00	16	6	25.27
13	9	20.80	14	20	23.07	16	7	25.34
13	10	20.87	14	21	23.13	16	8	25.40
13	11	20.93	14	22	23.20	16	9	25.47
13	12	21.00	14	23	23.26	16	10	25.54
13	13	21.06	15	0	23.33	16	11	25.60
13	14	21.13	15	1	23.39	16	12	25.66
13	15	21.19	15	2	23.46	16	13	25.73
13	16	21.25	15	3	23.52	16	14	25.79
13	17	21.32	15	4	23.59	16	15	25.86
13	18	21.38	15	5	23.65	16	16	25.92
13	19	21.45	15	6	23.72	16	17	25.98
13	20	21.51	15	7	23.78	16	18	26.05
13	21	21.58	15	8	23.85	16	19	26.11
13	22	21.64	15	9	23.91	16	20	26.18
13	23	21.71	15	10	23.98	16	21	26.24
14	0	21.77	15	11	24.04	16	22	26.31
14	1	21.84	15	12	24.11	16	23	26.37
14	2	21.90	15	13	24.17	17	0	26.44
14	3	21.97	15	14	24.24	17	1	26.50
14	4	22.03	15	15	24.30	17	2	26.57
14	5	22.10	15	16	24.36	17	3	26.63
14	6	22.16	15	17	24.43	17	4	26.70
14	7	22.23	15	18	24.49	17	5	26.76

*Pennyweights and Grains to Grams*

77

17.6—21.14

26.83—33.57

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
17	6	26.83	18	17	29.10	20	4	31.36
17	7	26.89	18	18	29.16	20	5	31.43
17	8	26.96	18	19	29.22	20	6	31.49
17	9	27.02	18	20	29.29	20	7	31.56
17	10	27.09	18	21	29.35	20	8	31.62
17	11	27.15	18	22	29.42	20	9	31.69
17	12	27.22	18	23	29.48	20	10	31.75
17	13	27.28	19	0	29.55	20	11	31.82
17	14	27.35	19	1	29.61	20	12	31.88
17	15	27.41	19	2	29.68	20	13	31.95
17	16	27.48	19	3	29.74	20	14	32.01
17	17	27.54	19	4	29.81	20	15	32.08
17	18	27.60	19	5	29.87	20	16	32.14
17	19	27.67	19	6	29.94	20	17	32.21
17	20	27.73	19	7	30.00	20	18	32.27
17	21	27.80	19	8	30.07	20	19	32.34
17	22	27.86	19	9	30.13	20	20	32.40
17	23	27.93	19	10	30.20	20	21	32.46
18	0	27.99	19	11	30.26	20	22	32.53
18	1	28.06	19	12	30.33	20	23	32.59
18	2	28.12	19	13	30.39	21	0	32.66
18	3	28.19	19	14	30.46	21	1	32.72
18	4	28.25	19	15	30.52	21	2	32.79
18	5	28.32	19	16	30.59	21	3	32.85
18	6	28.38	19	17	30.65	21	4	32.92
18	7	28.45	19	18	30.72	21	5	32.98
18	8	28.51	19	19	30.78	21	6	33.05
18	9	28.58	19	20	30.84	21	7	33.11
18	10	28.64	19	21	30.91	21	8	33.18
18	11	28.71	19	22	30.97	21	9	33.24
18	12	28.77	19	23	31.04	21	10	33.31
18	13	28.84	20	0	31.10	21	11	33.37
18	14	28.90	20	1	31.17	21	12	33.44
18	15	28.97	20	2	31.23	21	13	33.50
18	16	29.03	20	3	31.30	21	14	33.57

12.21—17.5

20.02—26.76

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
12	21	20.02	14	8	22.29	15	19	24.56
12	22	20.09	14	9	22.36	15	20	24.62
12	23	20.15	14	10	22.42	15	21	24.69
13	0	20.22	14	11	22.49	15	22	24.75
13	1	20.28	14	12	22.55	15	23	24.82
13	2	20.35	14	13	22.62	16	0	24.88
13	3	20.41	14	14	22.68	16	1	24.95
13	4	20.48	14	15	22.75	16	2	25.01
13	5	20.54	14	16	22.81	16	3	25.08
13	6	20.61	14	17	22.87	16	4	25.14
13	7	20.67	14	18	22.94	16	5	25.21
13	8	20.74	14	19	23.00	16	6	25.27
13	9	20.80	14	20	23.07	16	7	25.34
13	10	20.87	14	21	23.13	16	8	25.40
13	11	20.93	14	22	23.20	16	9	25.47
13	12	21.00	14	23	23.26	16	10	25.54
13	13	21.06	15	0	23.33	16	11	25.60
13	14	21.13	15	1	23.39	16	12	25.66
13	15	21.19	15	2	23.46	16	13	25.73
13	16	21.25	15	3	23.52	16	14	25.79
13	17	21.32	15	4	23.59	16	15	25.86
13	18	21.38	15	5	23.65	16	16	25.92
13	19	21.45	15	6	23.72	16	17	25.98
13	20	21.51	15	7	23.78	16	18	26.05
13	21	21.58	15	8	23.85	16	19	26.11
13	22	21.64	15	9	23.91	16	20	26.18
13	23	21.71	15	10	23.98	16	21	26.24
14	0	21.77	15	11	24.04	16	22	26.31
14	1	21.84	15	12	24.11	16	23	26.37
14	2	21.90	15	13	24.17	17	0	26.44
14	3	21.97	15	14	24.24	17	1	26.50
14	4	22.03	15	15	24.30	17	2	26.57
14	5	22.10	15	16	24.36	17	3	26.63
14	6	22.16	15	17	24.43	17	4	26.70
14	7	22.23	15	18	24.49	17	5	26.76

*Pennyweights and Grains to Grams*

77

17.6—21.14

26.83—33.57

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
17	6	26.83	18	17	29.10	20	4	31.36
17	7	26.89	18	18	29.16	20	5	31.43
17	8	26.96	18	19	29.22	20	6	31.49
17	9	27.02	18	20	29.29	20	7	31.56
17	10	27.09	18	21	29.35	20	8	31.62
17	11	27.15	18	22	29.42	20	9	31.69
17	12	27.22	18	23	29.48	20	10	31.75
17	13	27.28	19	0	29.55	20	11	31.82
17	14	27.35	19	1	29.61	20	12	31.88
17	15	27.41	19	2	29.68	20	13	31.95
17	16	27.48	19	3	29.74	20	14	32.01
17	17	27.54	19	4	29.81	20	15	32.08
17	18	27.60	19	5	29.87	20	16	32.14
17	19	27.67	19	6	29.94	20	17	32.21
17	20	27.73	19	7	30.00	20	18	32.27
17	21	27.80	19	8	30.07	20	19	32.34
17	22	27.86	19	9	30.13	20	20	32.40
17	23	27.93	19	10	30.20	20	21	32.46
18	0	27.99	19	11	30.26	20	22	32.53
18	1	28.06	19	12	30.33	20	23	32.59
18	2	28.12	19	13	30.39	21	0	32.66
18	3	28.19	19	14	30.46	21	1	32.72
18	4	28.25	19	15	30.52	21	2	32.79
18	5	28.32	19	16	30.59	21	3	32.85
18	6	28.38	19	17	30.65	21	4	32.92
18	7	28.45	19	18	30.72	21	5	32.98
18	8	28.51	19	19	30.78	21	6	33.05
18	9	28.58	19	20	30.84	21	7	33.11
18	10	28.64	19	21	30.91	21	8	33.18
18	11	28.71	19	22	30.97	21	9	33.24
18	12	28.77	19	23	31.04	21	10	33.31
18	13	28.84	20	0	31.10	21	11	33.37
18	14	28.90	20	1	31.17	21	12	33.44
18	15	28.97	20	2	31.23	21	13	33.50
18	16	29.03	20	3	31.30	21	14	33.57

21.15—25.23

33.63—40.37

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
21	15	33.63	23	2	35.90	24	13	38.17
21	16	33.70	23	3	35.96	24	14	38.23
21	17	33.76	23	4	36.03	24	15	38.30
21	18	33.83	23	5	36.09	24	16	38.36
21	19	33.89	23	6	36.16	24	17	38.43
21	20	33.96	23	7	36.22	24	18	38.49
21	21	34.02	23	8	36.29	24	19	38.56
21	22	34.08	23	9	36.35	24	20	38.62
21	23	34.15	23	10	36.42	24	21	38.69
22	0	34.21	23	11	36.48	24	22	38.75
22	1	34.28	23	12	36.55	24	23	38.82
22	2	34.34	23	13	36.61	25	0	38.88
22	3	34.41	23	14	36.68	25	1	38.94
22	4	34.47	23	15	36.74	25	2	39.01
22	5	34.54	23	16	36.81	25	3	39.07
22	6	34.60	23	17	36.87	25	4	39.14
22	7	34.67	23	18	36.94	25	5	39.20
22	8	34.73	23	19	37.00	25	6	39.27
22	9	34.80	23	20	37.07	25	7	39.33
22	10	34.86	23	21	37.13	25	8	39.40
22	11	34.93	23	22	37.20	25	9	39.46
22	12	34.99	23	23	37.26	25	10	39.53
22	13	35.06	24	0	37.32	25	11	39.59
22	14	35.12	24	1	37.39	25	12	39.66
22	15	35.19	24	2	37.45	25	13	39.72
22	16	35.25	24	3	37.52	25	14	39.79
22	17	35.32	24	4	37.58	25	15	39.85
22	18	35.38	24	5	37.65	25	16	39.92
22	19	35.45	24	6	37.71	25	17	39.98
22	20	35.51	24	7	37.78	25	18	40.05
22	21	35.58	24	8	37.84	25	19	40.11
22	22	35.64	24	9	37.91	25	20	40.18
22	23	35.70	24	10	37.97	25	21	40.24
23	0	35.77	24	11	38.04	25	22	40.31
23	1	35.83	24	12	38.10	25	23	40.37

*Pennyweights and Grains to Grams*

79

26,0—30,8

40.44—47.17

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
26	0	40.44	27	11	42.70	28	22	44.97
26	1	40.50	27	12	42.77	28	23	45.04
26	2	40.56	27	13	42.83	29	0	45.10
26	3	40.63	27	14	42.90	29	1	45.17
26	4	40.69	27	15	42.96	29	2	45.23
26	5	40.76	27	16	43.03	29	3	45.30
26	6	40.82	27	17	43.09	29	4	45.36
26	7	40.89	27	18	43.16	29	5	45.42
26	8	40.95	27	19	43.22	29	6	45.49
26	9	41.02	27	20	43.29	29	7	45.55
26	10	41.08	27	21	43.35	29	8	45.62
26	11	41.15	27	22	43.42	29	9	45.68
26	12	41.21	27	23	43.48	29	10	45.75
26	13	41.28	28	0	43.55	29	11	45.81
26	14	41.34	28	1	43.61	29	12	45.88
26	15	41.41	28	2	43.68	29	13	45.94
26	16	41.47	28	3	43.74	29	14	46.01
26	17	41.54	28	4	43.80	29	15	46.07
26	18	41.60	28	5	43.87	29	16	46.14
26	19	41.67	28	6	43.93	29	17	46.20
26	20	41.73	28	7	44.00	29	18	46.27
26	21	41.80	28	8	44.06	29	19	46.33
26	22	41.86	28	9	44.13	29	20	46.40
26	23	41.93	28	10	44.19	29	21	46.46
27	0	41.99	28	11	44.26	29	22	46.53
27	1	42.06	28	12	44.32	29	23	46.59
27	2	42.12	28	13	44.39	30	0	46.66
27	3	42.18	28	14	44.45	30	1	46.72
27	4	42.25	28	15	44.52	30	2	46.79
27	5	42.31	28	16	44.58	30	3	46.85
27	6	42.38	28	17	44.65	30	4	46.91
27	7	42.44	28	18	44.71	30	5	46.98
27	8	42.51	28	19	44.78	30	6	47.04
27	9	42.57	28	20	44.84	30	7	47.11
27	10	42.64	28	21	44.91	30	8	47.17

30.9—34.17

47.24—53.98

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
30	9	47.24	31	20	49.51	33	7	51.77
30	10	47.30	31	21	49.57	33	8	51.84
30	11	47.37	31	22	49.64	33	9	51.90
30	12	47.43	31	23	49.70	33	10	51.97
30	13	47.50	32	0	49.77	33	11	52.03
30	14	47.56	32	1	49.83	33	12	52.10
30	15	47.63	32	2	49.90	33	13	52.16
30	16	47.69	32	3	49.96	33	14	52.23
30	17	47.76	32	4	50.03	33	15	52.29
30	18	47.82	32	5	50.09	33	16	52.36
30	19	47.89	32	6	50.15	33	17	52.42
30	20	47.95	32	7	50.22	33	18	52.49
30	21	48.02	32	8	50.28	33	19	52.55
30	22	48.08	32	9	50.35	33	20	52.62
30	23	48.15	32	10	50.41	33	21	52.68
31	0	48.21	32	11	50.48	33	22	52.75
31	1	48.28	32	12	50.54	33	23	52.81
31	2	48.34	32	13	50.61	34	0	52.88
31	3	48.41	32	14	50.67	34	1	52.94
31	4	48.47	32	15	50.74	34	2	53.01
31	5	48.53	32	16	50.80	34	3	53.07
31	6	48.60	32	17	50.87	34	4	53.14
31	7	48.66	32	18	50.93	34	5	53.20
31	8	48.73	32	19	51.00	34	6	53.27
31	9	48.79	32	20	51.06	34	7	53.33
31	10	48.86	32	21	51.13	34	8	53.39
31	11	48.92	32	22	51.19	34	9	53.46
31	12	48.99	32	23	51.26	34	10	53.52
31	13	49.05	33	0	51.32	34	11	53.59
31	14	49.12	33	1	51.39	34	12	53.65
31	15	49.18	33	2	51.45	34	13	53.72
31	16	49.25	33	3	51.52	34	14	53.78
31	17	49.31	33	4	51.58	34	15	53.85
31	18	49.38	33	5	51.65	34	16	53.91
31	19	49.44	33	6	51.71	34	17	53.98

*Pennyweights and Grains to Grams*

81

34.18—39.2

54.04—60.78

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
34	18	54.04	36	5	56.31	37	16	58.58
34	19	54.11	36	6	56.38	37	17	58.64
34	20	54.17	36	7	56.44	37	18	58.71
34	21	54.24	36	8	56.51	37	19	58.77
34	22	54.30	36	9	56.57	37	20	58.84
34	23	54.37	36	10	56.63	37	21	58.90
35	0	54.43	36	11	56.70	37	22	58.97
35	1	54.50	36	12	56.76	37	23	59.03
35	2	54.56	36	13	56.83	38	0	59.10
35	3	54.63	36	14	56.89	38	1	59.16
35	4	54.69	36	15	56.96	38	2	59.23
35	5	54.76	36	16	57.02	38	3	59.29
35	6	54.82	36	17	57.09	38	4	59.36
35	7	54.89	36	18	57.15	38	5	59.42
35	8	54.95	36	19	57.22	38	6	59.49
35	9	55.01	36	20	57.28	38	7	59.55
35	10	55.08	36	21	57.35	38	8	59.62
35	11	55.14	36	22	57.41	38	9	59.68
35	12	55.21	36	23	57.48	38	10	59.75
35	13	55.27	37	0	57.54	38	11	59.81
35	14	55.34	37	1	57.61	38	12	59.87
35	15	55.40	37	2	57.67	38	13	59.94
35	16	55.47	37	3	57.74	38	14	60.00
35	17	55.53	37	4	57.80	38	15	60.07
35	18	55.60	37	5	57.87	38	16	60.13
35	19	55.66	37	6	57.93	38	17	60.20
35	20	55.73	37	7	58.00	38	18	60.26
35	21	55.79	37	8	58.06	38	19	60.33
35	22	55.86	37	9	58.13	38	20	60.39
35	23	55.92	37	10	58.19	38	21	60.46
36	0	55.99	37	11	58.25	38	22	60.52
36	1	56.05	37	12	58.32	38	23	60.59
36	2	56.12	37	13	58.38	39	0	60.65
36	3	56.18	37	14	58.45	39	1	60.72
36	4	56.25	37	15	58.51	39	2	60.78



39.3—43.11

60.85—67.59

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
39	3	60.85	40	14	63.11	42	1	65.38
39	4	60.91	40	15	63.18	42	2	65.45
39	5	60.98	40	16	63.24	42	3	65.51
39	6	61.04	40	17	63.31	42	4	65.58
39	7	61.11	40	18	63.37	42	5	65.64
39	8	61.17	40	19	63.44	42	6	65.71
39	9	61.24	40	20	63.50	42	7	65.77
39	10	61.30	40	21	63.57	42	8	65.84
39	11	61.37	40	22	63.63	42	9	65.90
39	12	61.43	40	23	63.70	42	10	65.97
39	13	61.49	41	0	63.76	42	11	66.03
39	14	61.56	41	1	63.83	42	12	66.10
39	15	61.62	41	2	63.89	42	13	66.16
39	16	61.69	41	3	63.96	42	14	66.23
39	17	61.75	41	4	64.02	42	15	66.29
39	18	61.82	41	5	64.09	42	16	66.35
39	19	61.88	41	6	64.15	42	17	66.42
39	20	61.95	41	7	64.22	42	18	66.48
39	21	62.01	41	8	64.28	42	19	66.55
39	22	62.08	41	9	64.35	42	20	66.61
39	23	62.14	41	10	64.41	42	21	66.68
40	0	62.21	41	11	64.48	42	22	66.74
40	1	62.27	41	12	64.54	42	23	66.81
40	2	62.34	41	13	64.61	43	0	66.87
40	3	62.40	41	14	64.67	43	1	66.94
40	4	62.47	41	15	64.73	43	2	67.00
40	5	62.53	41	16	64.80	43	3	67.07
40	6	62.60	41	17	64.86	43	4	67.13
40	7	62.66	41	18	64.93	43	5	67.20
40	8	62.73	41	19	64.99	43	6	67.26
40	9	62.79	41	20	65.06	43	7	67.33
40	10	62.86	41	21	65.12	43	8	67.39
40	11	62.92	41	22	65.19	43	9	67.46
40	12	62.99	41	23	65.25	43	10	67.52
40	13	63.05	42	0	65.32	43	11	67.59

*Pennyweights and Grains to Grams*

83

43.12—47.20

67.65—74.39

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
43	12	67.65	44	23	69.92	46	10	72.19
43	13	67.72	45	0	69.98	46	11	72.25
43	14	67.78	45	1	70.05	46	12	72.32
43	15	67.85	45	2	70.11	46	13	72.38
43	16	67.91	45	3	70.18	46	14	72.45
43	17	67.97	45	4	70.24	46	15	72.51
43	18	68.04	45	5	70.31	46	16	72.58
43	19	68.10	45	6	70.37	46	17	72.64
43	20	68.17	45	7	70.44	46	18	72.71
43	21	68.23	45	8	70.50	46	19	72.77
43	22	68.30	45	9	70.57	46	20	72.83
43	23	68.36	45	10	70.63	46	21	72.90
44	0	68.43	45	11	70.70	46	22	72.96
44	1	68.49	45	12	70.76	46	23	73.03
44	2	68.56	45	13	70.83	47	0	73.09
44	3	68.62	45	14	70.89	47	1	73.16
44	4	68.69	45	15	70.96	47	2	73.22
44	5	68.75	45	16	71.02	47	3	73.29
44	6	68.82	45	17	71.09	47	4	73.35
44	7	68.88	45	18	71.15	47	5	73.42
44	8	68.95	45	19	71.21	47	6	73.48
44	9	69.01	45	20	71.28	47	7	73.55
44	10	69.08	45	21	71.34	47	8	73.61
44	11	69.14	45	22	71.41	47	9	73.68
44	12	69.21	45	23	71.47	47	10	73.74
44	13	69.27	46	0	71.54	47	11	73.81
44	14	69.34	46	1	71.60	47	12	73.87
44	15	69.40	46	2	71.67	47	13	73.94
44	16	69.47	46	3	71.73	47	14	74.00
44	17	69.53	46	4	71.80	47	15	74.07
44	18	69.59	46	5	71.86	47	16	74.13
44	19	69.66	46	6	71.93	47	17	74.20
44	20	69.72	46	7	71.99	47	18	74.26
44	21	69.79	46	8	72.06	47	19	74.33
44	22	69.85	46	9	72.12	47	20	74.39

47.21—52.5

74.45—81.19

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
47	21	74.45	49	8	76.72	50	19	78.99
47	22	74.52	49	9	76.79	50	20	79.06
47	23	74.58	49	10	76.85	50	21	79.12
48	0	74.65	49	11	76.92	50	22	79.18
48	1	74.71	49	12	76.98	50	23	79.25
48	2	74.78	49	13	77.05	51	0	79.31
48	3	74.84	49	14	77.11	51	1	79.38
48	4	74.91	49	15	77.18	51	2	79.44
48	5	74.97	49	16	77.24	51	3	79.51
48	6	75.04	49	17	77.31	51	4	79.57
48	7	75.10	49	18	77.37	51	5	79.64
48	8	75.17	49	19	77.44	51	6	79.70
48	9	75.23	49	20	77.50	51	7	79.77
48	10	75.30	49	21	77.56	51	8	79.83
48	11	75.36	49	22	77.63	51	9	79.90
48	12	75.43	49	23	77.69	51	10	79.96
48	13	75.49	50	0	77.76	51	11	80.03
48	14	75.56	50	1	77.82	51	12	80.09
48	15	75.62	50	2	77.89	51	13	80.16
48	16	75.69	50	3	77.95	51	14	80.22
48	17	75.75	50	4	78.02	51	15	80.29
48	18	75.82	50	5	78.08	51	16	80.35
48	19	75.88	50	6	78.15	51	17	80.42
48	20	75.95	50	7	78.21	51	18	80.48
48	21	76.01	50	8	78.28	51	19	80.55
48	22	76.07	50	9	78.34	51	20	80.61
48	23	76.14	50	10	78.41	51	21	80.68
49	0	76.20	50	11	78.47	51	22	80.74
49	1	76.27	50	12	78.54	51	23	80.80
49	2	76.33	50	13	78.60	52	0	80.87
49	3	76.40	50	14	78.67	52	1	80.93
49	4	76.46	50	15	77.73	52	2	81.00
49	5	76.63	50	16	78.80	52	3	81.06
49	6	76.59	50	17	78.86	52	4	81.13
49	7	76.66	50	18	78.93	52	5	81.19

*Pennyweights and Grains to Grams*

85

52.6—56.14

81.26—88.00

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
52	6	81.26	53	17	83.53	55	4	85.79
52	7	81.32	53	18	83.59	55	5	85.86
52	8	81.39	53	19	83.66	55	6	85.92
52	9	81.45	53	20	83.72	55	7	85.99
52	10	81.52	53	21	83.79	55	8	86.05
52	11	81.58	53	22	83.85	55	9	86.12
52	12	81.65	53	23	83.92	55	10	86.18
52	13	81.71	54	0	83.98	55	11	86.25
52	14	81.78	54	1	84.04	55	12	86.31
52	15	81.84	54	2	84.11	55	13	86.38
52	16	81.91	54	3	84.17	55	14	86.44
52	17	81.97	54	4	84.24	55	15	86.51
52	18	82.04	54	5	84.30	55	16	86.57
52	19	82.10	54	6	84.37	55	17	86.64
52	20	82.17	54	7	84.43	55	18	86.70
52	21	82.23	54	8	84.50	55	19	86.77
52	22	82.30	54	9	84.56	55	20	86.83
52	23	82.36	54	10	84.63	55	21	86.90
53	0	82.42	54	11	84.69	55	22	86.96
53	1	82.49	54	12	84.76	55	23	87.03
53	2	82.55	54	13	84.82	56	0	87.09
53	3	82.62	54	14	84.89	56	1	87.16
53	4	82.68	54	15	84.95	56	2	87.22
53	5	82.75	54	16	85.02	56	3	87.28
53	6	82.81	54	17	85.08	56	4	87.35
53	7	82.88	54	18	85.15	56	5	87.41
53	8	82.94	54	19	85.21	56	6	87.48
53	9	83.01	54	20	85.28	56	7	87.54
53	10	83.07	54	21	85.34	56	8	87.61
53	11	83.14	54	22	85.41	56	9	87.67
53	12	83.20	54	23	85.47	56	10	87.74
53	13	83.27	55	0	85.54	56	11	87.80
53	14	83.33	55	1	85.60	56	12	87.87
53	15	83.40	55	2	85.66	56	13	87.93
53	16	83.46	55	3	85.73	56	14	88.00

56.15—60.23

88.06—94.80

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
56	15	88.06	58	2	90.33	59	13	92.60
56	16	88.13	58	3	90.40	59	14	92.66
56	17	88.19	58	4	90.46	59	15	92.73
56	18	88.26	58	5	90.52	59	16	92.79
56	19	88.32	58	6	90.59	59	17	92.86
56	20	88.39	58	7	90.65	59	18	92.92
56	21	88.45	58	8	90.72	59	19	92.99
56	22	88.52	58	9	90.78	59	20	93.05
56	23	88.58	58	10	90.85	59	21	93.12
57	0	88.65	58	11	90.91	59	22	93.18
57	1	88.71	58	12	90.98	59	23	93.25
57	2	88.78	58	13	91.04	60	0	93.31
57	3	88.84	58	14	91.11	60	1	93.38
57	4	88.90	58	15	91.17	60	2	93.44
57	5	88.97	58	16	91.24	60	3	93.51
57	6	89.03	58	17	91.30	60	4	93.57
57	7	89.10	58	18	91.37	60	5	93.64
57	8	89.16	58	19	91.43	60	6	93.70
57	9	89.23	58	20	91.50	60	7	93.76
57	10	89.29	58	21	91.56	60	8	93.83
57	11	89.36	58	22	91.63	60	9	93.89
57	12	89.42	58	23	91.69	60	10	93.96
57	13	89.49	59	0	91.76	60	11	94.02
57	14	89.55	59	1	91.82	60	12	94.09
57	15	89.62	59	2	91.89	60	13	94.15
57	16	89.68	59	3	91.95	60	14	94.22
57	17	89.75	59	4	92.02	60	15	94.28
57	18	89.81	59	5	92.08	60	16	94.35
57	19	89.88	59	6	92.14	60	17	94.41
57	20	89.94	59	7	92.21	60	18	94.48
57	21	90.01	59	8	92.27	60	19	94.54
57	22	90.07	59	9	92.34	60	20	94.61
57	23	90.14	59	10	92.40	60	21	94.67
58	0	90.20	59	11	92.47	60	22	94.74
58	1	90.27	59	12	92.53	60	23	94.80

*Pennyweights and Grains to Grams*

87

61.0—64.23

94.87—101.02

<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grains</i>	<i>Grams</i>
61	0	94.87	62	8	96.94	63	16	99.01
61	1	94.93	62	9	97.00	63	17	99.08
61	2	95.00	62	10	97.07	63	18	99.14
61	3	95.06	62	11	97.13	63	19	99.21
61	4	95.13	62	12	97.20	63	20	99.27
61	5	95.19	62	13	97.26	63	21	99.34
61	6	95.26	62	14	97.33	63	22	99.40
61	7	95.32	62	15	97.39	63	23	99.47
61	8	95.38	62	16	97.46	64	0	99.53
61	9	95.45	62	17	97.52	64	1	99.60
61	10	95.51	62	18	97.59	64	2	99.66
61	11	95.58	62	19	97.65	64	3	99.73
61	12	95.64	62	20	97.72	64	4	99.79
61	13	95.71	62	21	97.78	64	5	99.86
61	14	95.77	62	22	97.85	64	6	99.92
61	15	95.84	62	23	97.91	64	7	99.99
61	16	95.90	63	0	97.98	64	8	100.05
61	17	95.97	63	1	98.04	64	9	100.11
61	18	96.03	63	2	98.11	64	10	100.18
61	19	96.10	63	3	98.17	64	11	100.24
61	20	96.16	63	4	98.24	64	12	100.31
61	21	96.23	63	5	98.30	64	13	100.37
61	22	96.29	63	6	98.37	64	14	100.44
61	23	96.36	63	7	98.43	64	15	100.50
62	0	96.42	63	8	98.50	64	16	100.57
62	1	96.49	63	9	98.56	64	17	100.63
62	2	96.55	63	10	98.62	64	18	100.70
62	3	96.62	63	11	98.69	64	19	100.76
62	4	96.68	63	12	98.75	64	20	100.83
62	5	96.75	63	13	98.82	64	21	100.89
62	6	96.81	93	14	98.88	64	22	100.96
62	7	96.88	63	15	98.95	64	23	101.02

TABLE III  
TROY OUNCES AND PENNYWEIGHTS TO GRAMS

1.0—4.14

31.10—146.19

<i>Oz.</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Oz.</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Oz.</i>	<i>Dwt.</i>	<i>Grams</i>
1	0	31.10	2	5	69.98	3	10	108.86
1	1	32.66	2	6	71.54	3	11	110.42
1	2	34.21	2	7	73.09	3	12	111.97
1	3	35.77	2	8	74.65	3	13	113.53
1	4	37.32	2	9	76.20	3	14	115.08
1	5	38.88	2	10	77.76	3	15	116.64
1	6	40.44	2	11	79.31	3	16	118.19
1	7	41.99	2	12	80.87	3	17	119.75
1	8	43.55	2	13	82.43	3	18	121.30
1	9	45.10	2	14	83.98	3	19	122.86
1	10	46.66	2	15	85.54	4	0	124.41
1	11	48.21	2	16	87.09	4	1	125.97
1	12	49.77	2	17	88.65	4	2	127.52
1	13	51.32	2	18	90.20	4	3	129.08
1	14	52.88	2	19	91.76	4	4	130.64
1	15	54.43	3	0	93.31	4	5	132.19
1	16	55.99	3	1	94.87	4	6	133.75
1	17	57.54	3	2	96.42	4	7	135.30
1	18	59.10	3	3	97.98	4	8	136.86
1	19	60.65	3	4	99.53	4	9	138.41
2	0	62.21	3	5	101.09	4	10	139.97
2	1	63.76	3	6	102.64	4	11	141.52
2	2	65.32	3	7	104.20	4	12	143.08
2	3	66.87	3	8	105.75	4	13	144.63
2	4	68.43	3	9	107.31	4	14	146.19

*Troy Ounces and Pennyweights to Grams*

89

4.15—8.19

147.74—278.38

Oz.	Dwt.	Grams	Oz.	Dwt.	Grams	Oz.	Dwt.	Grams
4	15	147.74	6	4	192.84	7	12	236.39
4	16	149.30	6	5	194.40	7	13	237.94
4	17	150.85	6	6	195.95	7	14	239.50
4	18	152.41	6	7	197.51	7	15	241.05
4	19	153.96	6	8	199.06	7	16	242.61
5	0	155.52	6	9	200.62	7	17	244.16
5	1	157.07	6	10	202.17	7	18	245.72
5	2	158.63	6	11	203.73	7	19	247.27
5	3	160.18	6	12	205.28	8	0	248.83
5	4	161.74	6	13	206.84	8	1	250.38
5	5	163.29	6	14	208.39	8	2	251.94
5	6	164.85	6	15	209.95	8	3	253.49
5	7	166.40	6	16	211.50	8	4	255.05
5	8	167.96	6	17	213.06	8	5	256.60
5	9	169.51	6	18	214.62	8	6	258.16
5	10	171.07	6	19	216.17	8	7	259.71
5	11	172.63	7	0	217.72	8	8	261.27
5	12	174.18	7	1	219.28	8	9	262.83
5	13	175.74	7	2	220.84	8	10	264.38
5	14	177.29	7	3	222.39	8	11	265.94
5	15	178.85	7	4	223.95	8	12	267.49
5	16	180.40	7	5	225.50	8	13	269.05
5	17	181.96	7	6	227.06	8	14	270.60
5	18	182.51	7	7	228.61	8	15	272.16
5	19	184.07	7	8	230.17	8	16	273.71
6	0	186.62	7	9	231.72	8	17	275.27
6	1	188.18	7	10	233.28	8	18	276.82
6	2	189.73	7	11	234.83	8	19	278.38
6	3	191.29						



TABLE IV  
FRACTIONAL PENNYWEIGHTS TO GRAMS

$\frac{1}{8}$ — $9\frac{1}{8}$				0.19—14.19			
<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
$\frac{1}{8}$	0.19	$2\frac{3}{8}$	3.69	$4\frac{2}{3}$	7.26	7	10.89
$\frac{1}{4}$	0.39	$2\frac{1}{2}$	3.89	$4\frac{3}{4}$	7.39		
$\frac{1}{3}$	0.52	$2\frac{5}{8}$	4.08	$4\frac{7}{8}$	7.58	$7\frac{1}{8}$	11.08
$\frac{3}{8}$	0.58	$2\frac{2}{3}$	4.15	5	7.78	$7\frac{1}{4}$	11.28
$\frac{1}{2}$	0.78	$2\frac{3}{4}$	4.28			$7\frac{1}{3}$	11.41
$\frac{5}{8}$	0.97	$2\frac{7}{8}$	4.47	$5\frac{1}{8}$	7.97	$7\frac{3}{8}$	11.47
$\frac{2}{3}$	1.04	3	4.67	$5\frac{1}{4}$	8.17	$7\frac{1}{2}$	11.66
$\frac{3}{4}$	1.17			$5\frac{1}{3}$	8.29	$7\frac{5}{8}$	11.86
$\frac{7}{8}$	1.36	$3\frac{1}{8}$	4.86	$5\frac{3}{8}$	8.36	$7\frac{2}{3}$	11.92
I	1.56	$3\frac{1}{4}$	5.05	$5\frac{1}{2}$	8.55	$7\frac{3}{4}$	12.05
		$3\frac{1}{3}$	5.18	$5\frac{5}{8}$	8.75	$7\frac{7}{8}$	12.25
$I\frac{1}{8}$	1.75	$3\frac{3}{8}$	5.25	$5\frac{2}{3}$	8.81	8	12.44
$I\frac{1}{4}$	1.94	$3\frac{1}{2}$	5.44	$5\frac{3}{4}$	8.94		
$I\frac{1}{3}$	2.07	$3\frac{5}{8}$	5.64	$5\frac{7}{8}$	9.14	$8\frac{1}{8}$	12.64
$I\frac{3}{8}$	2.14	$3\frac{2}{3}$	5.70	6	9.33	$8\frac{1}{4}$	12.83
$I\frac{1}{2}$	2.33	$3\frac{3}{4}$	5.83			$8\frac{1}{3}$	12.96
$I\frac{5}{8}$	2.53	$3\frac{7}{8}$	6.03	$6\frac{1}{8}$	9.53	$8\frac{3}{8}$	13.03
$I\frac{2}{3}$	2.59	4	6.22	$6\frac{1}{4}$	9.72	$8\frac{1}{2}$	13.22
$I\frac{3}{4}$	2.72			$6\frac{1}{3}$	9.85	$8\frac{5}{8}$	13.41
$I\frac{7}{8}$	2.92	$4\frac{1}{8}$	6.42	$6\frac{3}{8}$	9.91	$8\frac{2}{3}$	13.48
2	3.11	$4\frac{1}{4}$	6.61	$6\frac{1}{2}$	10.11	$8\frac{3}{4}$	13.61
		$4\frac{1}{3}$	6.74	$6\frac{5}{8}$	10.30	$8\frac{7}{8}$	13.80
$2\frac{1}{8}$	3.31	$4\frac{3}{8}$	6.80	$6\frac{2}{3}$	10.37	9	14.00
$2\frac{1}{4}$	3.50	$4\frac{1}{2}$	7.00	$6\frac{3}{4}$	10.50		
$2\frac{1}{3}$	3.63	$4\frac{5}{8}$	7.19	$6\frac{7}{8}$	10.69	$9\frac{1}{8}$	14.19

*Fractional Pennyweights to Grams*

91

$9\frac{1}{4}$ — $21\frac{7}{8}$

14.39—34.02

<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
$9\frac{1}{4}$	14.39	$12\frac{3}{8}$	19.25	$15\frac{5}{8}$	24.30	$18\frac{3}{4}$	29.16
$9\frac{1}{3}$	14.52	$12\frac{1}{2}$	19.44	$15\frac{2}{3}$	24.36	$18\frac{7}{8}$	29.35
$9\frac{3}{8}$	14.58	$12\frac{5}{8}$	19.63	$15\frac{3}{4}$	24.49	19	29.55
$9\frac{1}{2}$	14.77	$12\frac{2}{3}$	19.70	$15\frac{7}{8}$	24.69		
$9\frac{5}{8}$	14.97	$12\frac{3}{4}$	19.83	16	24.88	$19\frac{1}{8}$	29.74
$9\frac{2}{3}$	15.03	$12\frac{7}{8}$	20.02			$19\frac{1}{4}$	29.94
$9\frac{3}{4}$	15.16	13	20.22	$16\frac{1}{8}$	25.08	$19\frac{1}{3}$	30.07
$9\frac{7}{8}$	15.36			$16\frac{1}{4}$	25.27	$19\frac{3}{8}$	30.13
10	15.55	$13\frac{1}{8}$	20.41	$16\frac{1}{3}$	25.40	$19\frac{1}{2}$	30.33
		$13\frac{1}{4}$	20.61	$16\frac{3}{8}$	25.47	$19\frac{5}{8}$	30.52
$10\frac{1}{8}$	15.75	$13\frac{1}{3}$	20.74	$16\frac{1}{2}$	25.66	$19\frac{2}{3}$	30.59
$10\frac{1}{4}$	15.94	$13\frac{3}{8}$	20.80	$16\frac{5}{8}$	25.86	$19\frac{3}{4}$	30.72
$10\frac{1}{3}$	16.07	$13\frac{1}{2}$	21.00	$16\frac{2}{3}$	25.92	$19\frac{7}{8}$	30.91
$10\frac{3}{8}$	16.14	$13\frac{5}{8}$	21.19	$16\frac{3}{4}$	26.05	20	31.10
$10\frac{1}{2}$	16.33	$13\frac{2}{3}$	21.25	$16\frac{7}{8}$	26.24		
$10\frac{5}{8}$	16.52	$13\frac{3}{4}$	21.38	17	26.44	$20\frac{1}{8}$	31.30
$10\frac{2}{3}$	16.59	$13\frac{7}{8}$	21.58			$20\frac{1}{4}$	31.49
$10\frac{3}{4}$	16.72	14	21.77	$17\frac{1}{8}$	26.63	$20\frac{1}{3}$	31.62
$10\frac{7}{8}$	16.91			$17\frac{1}{4}$	26.83	$20\frac{3}{8}$	31.69
11	17.11	$14\frac{1}{8}$	21.97	$17\frac{1}{3}$	26.96	$20\frac{1}{2}$	31.88
		$14\frac{1}{4}$	22.16	$17\frac{3}{8}$	27.02	$20\frac{5}{8}$	32.08
$11\frac{1}{8}$	17.30	$14\frac{1}{3}$	22.29	$17\frac{1}{2}$	27.22	$20\frac{2}{3}$	32.14
$11\frac{1}{4}$	17.50	$14\frac{3}{8}$	22.36	$17\frac{5}{8}$	27.41	$20\frac{3}{4}$	32.27
$11\frac{1}{3}$	17.63	$14\frac{1}{2}$	22.55	$17\frac{2}{3}$	27.48	$20\frac{7}{8}$	32.46
$11\frac{3}{8}$	17.69	$14\frac{5}{8}$	22.75	$17\frac{3}{4}$	27.60	21	32.66
$11\frac{1}{2}$	17.89	$14\frac{2}{3}$	22.81	$17\frac{7}{8}$	27.80		
$11\frac{5}{8}$	18.08	$14\frac{3}{4}$	22.94	18	27.99	$21\frac{1}{8}$	32.85
$11\frac{2}{3}$	18.14	$14\frac{7}{8}$	23.13			$21\frac{1}{4}$	33.05
$11\frac{3}{4}$	18.27	15	23.33	$18\frac{1}{8}$	28.19	$21\frac{1}{3}$	33.18
$11\frac{7}{8}$	18.47			$18\frac{1}{4}$	28.38	$21\frac{3}{8}$	33.24
12	18.66	$15\frac{1}{8}$	23.52	$18\frac{1}{3}$	28.51	$21\frac{1}{2}$	33.44
		$15\frac{1}{4}$	23.72	$18\frac{3}{8}$	28.58	$21\frac{5}{8}$	33.63
$12\frac{1}{8}$	18.86	$15\frac{1}{3}$	23.85	$18\frac{1}{2}$	28.77	$21\frac{2}{3}$	33.70
$12\frac{1}{4}$	19.05	$15\frac{3}{8}$	23.91	$18\frac{5}{8}$	28.97	$21\frac{3}{4}$	33.83
$12\frac{1}{3}$	19.18	$15\frac{1}{2}$	24.11	$18\frac{2}{3}$	29.03	$21\frac{7}{8}$	34.02

22—34<sup>5</sup>/<sub>8</sub>

34.21—53.85

<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
22	34.21	25 <sup>1</sup> / <sub>8</sub>	39.07	28 <sup>1</sup> / <sub>8</sub>	44.06	31 <sup>1</sup> / <sub>2</sub>	48.99
		25 <sup>1</sup> / <sub>4</sub>	39.27	28 <sup>3</sup> / <sub>8</sub>	44.13	31 <sup>5</sup> / <sub>8</sub>	49.18
22 <sup>1</sup> / <sub>8</sub>	34.41	25 <sup>1</sup> / <sub>3</sub>	39.40	28 <sup>1</sup> / <sub>2</sub>	44.32	31 <sup>2</sup> / <sub>3</sub>	49.25
22 <sup>1</sup> / <sub>4</sub>	34.60	25 <sup>3</sup> / <sub>8</sub>	39.46	28 <sup>5</sup> / <sub>8</sub>	44.52	31 <sup>3</sup> / <sub>8</sub>	49.38
22 <sup>1</sup> / <sub>3</sub>	34.73	25 <sup>1</sup> / <sub>2</sub>	39.66	28 <sup>2</sup> / <sub>3</sub>	44.58	31 <sup>7</sup> / <sub>8</sub>	49.57
22 <sup>3</sup> / <sub>8</sub>	34.80	25 <sup>5</sup> / <sub>8</sub>	39.85	28 <sup>3</sup> / <sub>4</sub>	44.71	32	49.77
22 <sup>1</sup> / <sub>2</sub>	34.99	25 <sup>2</sup> / <sub>3</sub>	39.92	28 <sup>7</sup> / <sub>8</sub>	44.91		
22 <sup>5</sup> / <sub>8</sub>	35.19	25 <sup>3</sup> / <sub>4</sub>	40.05	29	45.10	32 <sup>1</sup> / <sub>8</sub>	49.96
22 <sup>2</sup> / <sub>3</sub>	35.25	25 <sup>7</sup> / <sub>8</sub>	40.24			32 <sup>1</sup> / <sub>4</sub>	50.15
22 <sup>3</sup> / <sub>4</sub>	35.38	26	40.44	29 <sup>1</sup> / <sub>8</sub>	45.30	32 <sup>1</sup> / <sub>3</sub>	50.28
22 <sup>7</sup> / <sub>8</sub>	35.58			29 <sup>1</sup> / <sub>4</sub>	45.49	32 <sup>3</sup> / <sub>8</sub>	50.35
23	35.77	26 <sup>1</sup> / <sub>8</sub>	40.63	29 <sup>1</sup> / <sub>3</sub>	45.62	32 <sup>1</sup> / <sub>2</sub>	50.54
		26 <sup>1</sup> / <sub>4</sub>	40.82	29 <sup>3</sup> / <sub>8</sub>	45.68	32 <sup>5</sup> / <sub>8</sub>	50.74
23 <sup>1</sup> / <sub>8</sub>	35.96	26 <sup>1</sup> / <sub>3</sub>	40.95	29 <sup>1</sup> / <sub>2</sub>	45.88	32 <sup>2</sup> / <sub>3</sub>	50.80
23 <sup>1</sup> / <sub>4</sub>	36.16	26 <sup>3</sup> / <sub>8</sub>	41.02	29 <sup>5</sup> / <sub>8</sub>	46.07	32 <sup>3</sup> / <sub>4</sub>	50.93
23 <sup>1</sup> / <sub>3</sub>	36.29	26 <sup>1</sup> / <sub>2</sub>	41.21	29 <sup>2</sup> / <sub>3</sub>	46.14	32 <sup>7</sup> / <sub>8</sub>	51.13
23 <sup>3</sup> / <sub>8</sub>	36.35	26 <sup>5</sup> / <sub>8</sub>	41.41	29 <sup>3</sup> / <sub>4</sub>	46.27	33	51.32
23 <sup>1</sup> / <sub>2</sub>	36.55	26 <sup>2</sup> / <sub>3</sub>	41.47	29 <sup>7</sup> / <sub>8</sub>	46.46		
23 <sup>5</sup> / <sub>8</sub>	36.74	26 <sup>3</sup> / <sub>4</sub>	41.60	30	46.66	33 <sup>1</sup> / <sub>8</sub>	51.52
23 <sup>2</sup> / <sub>3</sub>	36.81	26 <sup>7</sup> / <sub>8</sub>	41.80			33 <sup>1</sup> / <sub>4</sub>	51.71
23 <sup>3</sup> / <sub>4</sub>	36.94	27	41.99	30 <sup>1</sup> / <sub>8</sub>	46.85	33 <sup>1</sup> / <sub>3</sub>	51.84
23 <sup>7</sup> / <sub>8</sub>	37.13			30 <sup>1</sup> / <sub>4</sub>	46.04	33 <sup>3</sup> / <sub>8</sub>	51.90
24	37.32	27 <sup>1</sup> / <sub>8</sub>	42.18	30 <sup>1</sup> / <sub>3</sub>	47.17	33 <sup>1</sup> / <sub>2</sub>	52.10
		27 <sup>1</sup> / <sub>4</sub>	42.38	30 <sup>3</sup> / <sub>8</sub>	47.24	33 <sup>5</sup> / <sub>8</sub>	52.29
24 <sup>1</sup> / <sub>8</sub>	37.52	27 <sup>1</sup> / <sub>3</sub>	42.51	30 <sup>1</sup> / <sub>2</sub>	47.43	33 <sup>2</sup> / <sub>3</sub>	52.36
24 <sup>1</sup> / <sub>4</sub>	37.71	27 <sup>3</sup> / <sub>8</sub>	42.57	30 <sup>5</sup> / <sub>8</sub>	47.63	33 <sup>3</sup> / <sub>4</sub>	52.49
24 <sup>1</sup> / <sub>3</sub>	37.84	27 <sup>1</sup> / <sub>2</sub>	42.77	30 <sup>2</sup> / <sub>3</sub>	47.69	33 <sup>7</sup> / <sub>8</sub>	62.68
24 <sup>3</sup> / <sub>8</sub>	37.91	27 <sup>5</sup> / <sub>8</sub>	42.96	30 <sup>3</sup> / <sub>4</sub>	47.82	34	52.88
24 <sup>1</sup> / <sub>2</sub>	38.10	27 <sup>2</sup> / <sub>3</sub>	43.03	30 <sup>7</sup> / <sub>8</sub>	48.02		
24 <sup>5</sup> / <sub>8</sub>	38.30	27 <sup>3</sup> / <sub>4</sub>	43.16	31	48.21	34 <sup>1</sup> / <sub>8</sub>	53.07
24 <sup>2</sup> / <sub>3</sub>	38.36	27 <sup>7</sup> / <sub>8</sub>	43.35			34 <sup>1</sup> / <sub>4</sub>	53.27
24 <sup>3</sup> / <sub>4</sub>	38.49	28	43.55	31 <sup>1</sup> / <sub>8</sub>	48.41	34 <sup>1</sup> / <sub>3</sub>	53.39
24 <sup>7</sup> / <sub>8</sub>	38.69			31 <sup>1</sup> / <sub>4</sub>	48.60	34 <sup>3</sup> / <sub>8</sub>	53.46
25	38.88	28 <sup>1</sup> / <sub>8</sub>	43.74	31 <sup>1</sup> / <sub>3</sub>	48.73	34 <sup>1</sup> / <sub>2</sub>	53.65
		28 <sup>1</sup> / <sub>4</sub>	43.93	31 <sup>3</sup> / <sub>8</sub>	48.79	34 <sup>5</sup> / <sub>8</sub>	53.85

*Fractional Pennyweights to Grams*

93

$34\frac{2}{3}$ — $47\frac{3}{8}$

53.91—73.68

<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
$34\frac{2}{3}$	53.91	$37\frac{7}{8}$	58.90	$41\frac{1}{8}$	63.96	$44\frac{1}{3}$	68.95
$34\frac{3}{4}$	54.04	38	59.10	$41\frac{1}{4}$	64.15	$44\frac{3}{8}$	69.01
$34\frac{7}{8}$	54.24			$41\frac{1}{3}$	64.28	$44\frac{1}{2}$	69.21
35	54.43	$38\frac{1}{8}$	59.29	$41\frac{3}{8}$	64.35	$44\frac{5}{8}$	69.40
		$38\frac{1}{4}$	59.49	$41\frac{1}{2}$	64.54	$44\frac{2}{3}$	69.47
$35\frac{1}{8}$	54.63	$38\frac{1}{3}$	59.62	$41\frac{5}{8}$	64.73	$44\frac{3}{4}$	69.59
$35\frac{1}{4}$	54.82	$38\frac{3}{8}$	59.68	$41\frac{2}{3}$	64.80	$44\frac{7}{8}$	69.79
$35\frac{1}{3}$	54.95	$38\frac{1}{2}$	59.87	$41\frac{3}{4}$	64.93	45	69.98
$35\frac{3}{8}$	55.01	$38\frac{5}{8}$	60.07	$41\frac{7}{8}$	65.12		
$35\frac{1}{2}$	55.21	$38\frac{2}{3}$	60.13	42	65.32	$45\frac{1}{8}$	70.18
$35\frac{5}{8}$	55.40	$38\frac{3}{4}$	60.26			$45\frac{1}{4}$	70.37
$35\frac{2}{3}$	55.47	$38\frac{7}{8}$	60.46	$42\frac{1}{8}$	65.51	$45\frac{1}{3}$	70.50
$35\frac{3}{4}$	55.60	39	60.65	$42\frac{1}{4}$	65.71	$45\frac{3}{8}$	70.57
$35\frac{7}{8}$	55.79			$42\frac{1}{3}$	65.84	$45\frac{1}{2}$	70.76
36	55.99	$39\frac{1}{8}$	60.85	$42\frac{3}{8}$	65.90	$45\frac{5}{8}$	70.96
		$39\frac{1}{4}$	61.04	$42\frac{1}{2}$	66.10	$45\frac{2}{3}$	71.02
$36\frac{1}{8}$	56.18	$39\frac{1}{3}$	61.17	$42\frac{5}{8}$	66.29	$45\frac{3}{4}$	71.15
$36\frac{1}{4}$	56.38	$39\frac{3}{8}$	61.24	$42\frac{2}{3}$	66.35	$45\frac{7}{8}$	71.34
$36\frac{1}{3}$	56.51	$39\frac{1}{2}$	61.43	$42\frac{3}{4}$	66.48	46	71.54
$36\frac{3}{8}$	56.57	$39\frac{5}{8}$	61.62	$42\frac{7}{8}$	66.68		
$36\frac{1}{2}$	56.76	$39\frac{2}{3}$	61.69	43	66.87	$46\frac{1}{8}$	71.73
$36\frac{5}{8}$	56.96	$39\frac{3}{4}$	61.82			$46\frac{1}{4}$	71.93
$36\frac{2}{3}$	57.02	$39\frac{7}{8}$	62.01	$43\frac{1}{8}$	67.07	$46\frac{1}{3}$	72.06
$36\frac{3}{4}$	57.15	40	62.21	$43\frac{1}{4}$	67.26	$46\frac{3}{8}$	72.12
$36\frac{7}{8}$	57.35			$43\frac{1}{3}$	67.39	$46\frac{1}{2}$	72.32
37	57.54	$40\frac{1}{8}$	62.40	$43\frac{3}{8}$	67.46	$46\frac{5}{8}$	72.51
		$40\frac{1}{4}$	62.60	$43\frac{1}{2}$	67.65	$46\frac{2}{3}$	72.58
$37\frac{1}{8}$	57.74	$40\frac{1}{3}$	62.73	$43\frac{5}{8}$	67.85	$46\frac{3}{4}$	72.71
$37\frac{1}{4}$	57.93	$40\frac{3}{8}$	62.79	$43\frac{2}{3}$	67.91	$46\frac{7}{8}$	72.90
$37\frac{1}{3}$	58.06	$40\frac{1}{2}$	62.99	$43\frac{3}{4}$	68.04	47	73.09
$37\frac{3}{8}$	58.13	$40\frac{5}{8}$	63.18	$43\frac{7}{8}$	68.23		
$37\frac{1}{2}$	58.32	$40\frac{2}{3}$	63.24	44	68.43	$47\frac{1}{8}$	73.29
$37\frac{5}{8}$	58.51	$40\frac{3}{4}$	63.37			$47\frac{1}{4}$	73.48
$37\frac{2}{3}$	58.58	$40\frac{7}{8}$	63.57	$44\frac{1}{8}$	68.62	$47\frac{1}{3}$	73.61
$37\frac{3}{4}$	58.71	41	63.76	$44\frac{1}{4}$	68.82	$47\frac{3}{8}$	73.68

47 $\frac{1}{2}$ —60 $\frac{1}{4}$ 

73.87—93.70

<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
47 $\frac{1}{2}$	73.87	50 $\frac{2}{3}$	78.80	53 $\frac{7}{8}$	83.79	57 $\frac{1}{8}$	88.84
47 $\frac{5}{8}$	74.07	50 $\frac{3}{4}$	78.93	54	83.98	57 $\frac{1}{4}$	89.03
47 $\frac{2}{3}$	74.13	50 $\frac{7}{8}$	79.12			57 $\frac{1}{3}$	89.16
47 $\frac{3}{4}$	74.26	51	79.31	54 $\frac{1}{8}$	84.17	57 $\frac{3}{8}$	89.23
47 $\frac{7}{8}$	74.45			54 $\frac{1}{4}$	84.37	57 $\frac{1}{2}$	89.42
48	74.65	51 $\frac{1}{8}$	79.51	54 $\frac{1}{3}$	84.50	57 $\frac{5}{8}$	89.62
		51 $\frac{1}{4}$	79.70	54 $\frac{3}{8}$	84.56	57 $\frac{2}{3}$	89.68
48 $\frac{1}{8}$	74.84	51 $\frac{1}{3}$	79.83	54 $\frac{1}{2}$	84.76	57 $\frac{3}{4}$	89.81
48 $\frac{1}{4}$	75.04	51 $\frac{3}{8}$	79.90	54 $\frac{5}{8}$	84.95	57 $\frac{7}{8}$	90.01
48 $\frac{1}{3}$	75.17	51 $\frac{1}{2}$	80.09	54 $\frac{2}{3}$	85.02	58	90.20
48 $\frac{3}{8}$	75.23	51 $\frac{5}{8}$	80.29	54 $\frac{3}{4}$	85.15		
48 $\frac{1}{2}$	75.43	51 $\frac{2}{3}$	80.35	54 $\frac{7}{8}$	85.34	58 $\frac{1}{8}$	90.40
48 $\frac{5}{8}$	75.62	51 $\frac{3}{4}$	80.48	55	85.54	58 $\frac{1}{4}$	90.59
48 $\frac{2}{3}$	75.69	51 $\frac{7}{8}$	80.68			58 $\frac{1}{3}$	90.72
48 $\frac{3}{4}$	75.82	52	80.87	55 $\frac{1}{8}$	85.73	58 $\frac{3}{8}$	90.78
48 $\frac{7}{8}$	76.01			55 $\frac{1}{4}$	85.92	58 $\frac{1}{2}$	90.98
49	76.20	52 $\frac{1}{8}$	81.06	55 $\frac{1}{3}$	86.05	58 $\frac{5}{8}$	91.17
		52 $\frac{1}{4}$	81.26	55 $\frac{3}{8}$	86.12	58 $\frac{2}{3}$	91.24
49 $\frac{1}{8}$	76.40	52 $\frac{1}{3}$	81.39	55 $\frac{1}{2}$	86.31	58 $\frac{3}{4}$	91.37
49 $\frac{1}{4}$	76.59	52 $\frac{3}{8}$	81.45	55 $\frac{5}{8}$	86.51	58 $\frac{7}{8}$	91.56
49 $\frac{1}{3}$	76.72	52 $\frac{1}{2}$	81.65	55 $\frac{2}{3}$	86.57	59	91.76
49 $\frac{3}{8}$	76.79	52 $\frac{5}{8}$	81.84	55 $\frac{3}{4}$	86.70		
49 $\frac{1}{2}$	76.98	52 $\frac{2}{3}$	81.91	55 $\frac{7}{8}$	86.90	59 $\frac{1}{8}$	91.95
49 $\frac{5}{8}$	77.18	52 $\frac{3}{4}$	82.04	56	87.09	59 $\frac{1}{4}$	92.14
49 $\frac{2}{3}$	77.24	52 $\frac{7}{8}$	82.23			59 $\frac{1}{3}$	92.27
49 $\frac{3}{4}$	77.37	53	82.42	56 $\frac{1}{8}$	87.28	59 $\frac{3}{8}$	92.34
49 $\frac{7}{8}$	77.56			56 $\frac{1}{4}$	87.48	59 $\frac{1}{2}$	92.53
50	77.76	53 $\frac{1}{8}$	82.62	56 $\frac{1}{3}$	87.61	59 $\frac{5}{8}$	92.73
		53 $\frac{1}{4}$	82.81	56 $\frac{3}{8}$	87.67	59 $\frac{2}{3}$	92.79
50 $\frac{1}{8}$	77.95	53 $\frac{1}{3}$	82.94	56 $\frac{1}{2}$	87.87	59 $\frac{3}{4}$	92.92
50 $\frac{1}{4}$	78.15	53 $\frac{3}{8}$	83.01	56 $\frac{5}{8}$	88.06	59 $\frac{7}{8}$	93.12
50 $\frac{1}{3}$	78.28	53 $\frac{1}{2}$	83.20	56 $\frac{2}{3}$	88.13	60	93.31
50 $\frac{3}{8}$	78.34	53 $\frac{5}{8}$	83.40	56 $\frac{3}{4}$	88.26		
50 $\frac{1}{2}$	78.54	53 $\frac{2}{3}$	83.46	56 $\frac{7}{8}$	88.45	60 $\frac{1}{8}$	93.51
50 $\frac{5}{8}$	78.73	53 $\frac{3}{4}$	83.59	57	88.65	60 $\frac{1}{4}$	93.70

# Fractional Pennyweights to Grams

95

60<sup>1</sup>/<sub>3</sub>—64

93.83—99.53

<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>	<i>Dwt.</i>	<i>Grams</i>
60 <sup>1</sup> / <sub>3</sub>	93.83	61 <sup>1</sup> / <sub>8</sub>	95.06	62 <sup>1</sup> / <sub>8</sub>	96.62	63 <sup>1</sup> / <sub>8</sub>	98.17
60 <sup>3</sup> / <sub>8</sub>	93.89	61 <sup>1</sup> / <sub>4</sub>	95.26	62 <sup>1</sup> / <sub>4</sub>	96.81	63 <sup>1</sup> / <sub>4</sub>	98.37
60 <sup>1</sup> / <sub>2</sub>	94.09	61 <sup>1</sup> / <sub>3</sub>	95.38	62 <sup>1</sup> / <sub>3</sub>	96.94	63 <sup>1</sup> / <sub>3</sub>	98.50
60 <sup>5</sup> / <sub>8</sub>	94.28	61 <sup>3</sup> / <sub>8</sub>	95.45	62 <sup>3</sup> / <sub>8</sub>	97.00	63 <sup>3</sup> / <sub>8</sub>	98.56
60 <sup>2</sup> / <sub>3</sub>	94.35	61 <sup>1</sup> / <sub>2</sub>	95.64	62 <sup>1</sup> / <sub>2</sub>	97.20	63 <sup>1</sup> / <sub>2</sub>	98.75
60 <sup>3</sup> / <sub>4</sub>	94.48	61 <sup>5</sup> / <sub>8</sub>	95.84	62 <sup>5</sup> / <sub>8</sub>	97.39	63 <sup>5</sup> / <sub>8</sub>	98.95
60 <sup>7</sup> / <sub>8</sub>	94.67	61 <sup>2</sup> / <sub>3</sub>	95.90	62 <sup>2</sup> / <sub>3</sub>	97.46	63 <sup>2</sup> / <sub>3</sub>	99.01
61	94.87	61 <sup>3</sup> / <sub>4</sub>	96.03	62 <sup>3</sup> / <sub>4</sub>	97.59	63 <sup>3</sup> / <sub>4</sub>	99.14
		61 <sup>7</sup> / <sub>8</sub>	96.23	62 <sup>7</sup> / <sub>8</sub>	97.78	63 <sup>7</sup> / <sub>8</sub>	99.34
		62	96.42	63	97.98	64	99.53

TABLE V  
FRACTIONAL TROY OUNCES TO GRAMS

$\frac{1}{8}$ —8 3.89—248.83

<i>Oz.</i>	<i>Grams</i>	<i>Oz.</i>	<i>Grams</i>	<i>Oz.</i>	<i>Grams</i>	<i>Oz.</i>	<i>Grams</i>
$\frac{1}{8}$	3.89	$2\frac{1}{8}$	66.10	$4\frac{1}{8}$	128.30	$6\frac{1}{8}$	190.51
$\frac{1}{4}$	7.78	$2\frac{1}{4}$	69.98	$4\frac{1}{4}$	132.19	$6\frac{1}{4}$	194.40
$\frac{1}{3}$	10.37	$2\frac{1}{3}$	72.58	$4\frac{1}{3}$	134.78	$6\frac{1}{3}$	196.99
$\frac{3}{8}$	11.66	$2\frac{3}{8}$	73.87	$4\frac{3}{8}$	136.08	$6\frac{3}{8}$	198.29
$\frac{1}{2}$	15.55	$2\frac{1}{2}$	77.76	$4\frac{1}{2}$	139.97	$6\frac{1}{2}$	202.17
$\frac{5}{8}$	19.44	$2\frac{5}{8}$	81.65	$4\frac{5}{8}$	143.85	$6\frac{5}{8}$	206.06
$\frac{2}{3}$	20.74	$2\frac{2}{3}$	82.94	$4\frac{2}{3}$	145.15	$6\frac{2}{3}$	207.36
$\frac{3}{4}$	23.33	$2\frac{3}{4}$	85.54	$4\frac{3}{4}$	147.74	$6\frac{3}{4}$	209.95
$\frac{7}{8}$	27.22	$2\frac{7}{8}$	89.42	$4\frac{7}{8}$	151.63	$6\frac{7}{8}$	213.84
1	31.10	3	93.31	5	155.52	7	217.72
$1\frac{1}{8}$	34.99	$3\frac{1}{8}$	97.20	$5\frac{1}{8}$	159.41	$7\frac{1}{8}$	221.61
$1\frac{1}{4}$	38.88	$3\frac{1}{4}$	101.09	$5\frac{1}{4}$	163.29	$7\frac{1}{4}$	225.50
$1\frac{1}{3}$	41.47	$3\frac{1}{3}$	103.68	$5\frac{1}{3}$	165.89	$7\frac{1}{3}$	228.09
$1\frac{3}{8}$	42.47	$3\frac{3}{8}$	104.98	$5\frac{3}{8}$	167.18	$7\frac{3}{8}$	229.39
$1\frac{1}{2}$	46.66	$3\frac{1}{2}$	107.86	$5\frac{1}{2}$	171.07	$7\frac{1}{2}$	233.28
$1\frac{5}{8}$	50.54	$3\frac{5}{8}$	112.75	$5\frac{5}{8}$	174.96	$7\frac{5}{8}$	237.17
$1\frac{2}{3}$	51.84	$3\frac{2}{3}$	114.05	$5\frac{2}{3}$	176.25	$7\frac{2}{3}$	238.46
$1\frac{3}{4}$	54.43	$3\frac{3}{4}$	116.64	$5\frac{3}{4}$	178.85	$7\frac{3}{4}$	241.05
$1\frac{7}{8}$	58.32	$3\frac{7}{8}$	120.53	$5\frac{7}{8}$	182.73	$7\frac{7}{8}$	244.94
2	62.21	4	124.41	6	186.62	8	248.83

TABLE VI  
ROMAN SCRUPLES TO GRAMS

1.0—65.00

0.19—73.91

<i>Carats</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>
1.0		0.19	16.00	18.19	41.00	46.62
2.0		0.38	17.00	19.33	42.00	47.75
3.0		0.57	18.00	20.47	43.00	48.89
4.0		0.76	19.00	21.60	44.00	50.03
5.0		0.95	20.00	22.74	45.00	51.17
6.0	1.00	1.14	21.00	23.88	46.00	52.30
7.0		1.33	22.00	25.01	47.00	53.44
8.0		1.52	23.00	26.15	48.00	54.58
9.0		1.71	24.00	27.29	49.00	55.71
10.0		1.90	25.00	28.43	50.00	56.85
11.0		2.08	26.00	29.56	51.00	57.98
12.0	2.00	2.27	27.00	30.70	52.00	59.12
	3.00	3.41	28.00	31.84	53.00	60.26
	4.00	4.55	29.00	32.97	54.00	61.40
	5.00	5.69	30.00	34.11	55.00	62.54
	6.00	6.82	31.00	35.25	56.00	63.67
	7.00	7.96	32.00	36.38	57.00	64.81
	8.00	9.10	33.00	37.52	58.00	65.95
	9.00	10.23	34.00	38.66	59.00	67.08
	10.00	11.37	35.00	39.80	60.00	68.22
	11.00	12.51	36.00	40.93	61.00	69.36
	12.00	13.64	37.00	42.07	62.00	70.49
	13.00	14.78	38.00	43.21	63.00	71.63
	14.00	15.92	39.00	44.34	64.00	72.77
	15.00	17.06	40.00	45.48	65.00	73.91



66.00—205.00

75.04—233.09

Scruples	Grams	Scruples	Grams	Scruples	Grams	Scruples	Grams
66.00	75.04	101.00	114.84	136.00	154.63	171.00	194.43
67.00	76.18	102.00	115.97	137.00	155.77	172.00	195.56
68.00	77.32	103.00	117.11	138.00	156.91	173.00	196.70
69.00	78.45	104.00	118.25	139.00	158.04	174.00	197.84
70.00	79.59	105.00	119.39	140.00	159.18	175.00	198.98
71.00	80.73	106.00	120.52	141.00	160.32	176.00	200.11
72.00	81.86	107.00	121.66	142.00	161.45	177.00	201.25
73.00	83.00	108.00	122.77	143.00	162.59	178.00	202.39
74.00	84.14	109.00	123.93	144.00	163.73	179.00	203.52
75.00	85.28	110.00	125.07	145.00	164.87	180.00	204.66
76.00	86.41	111.00	126.21	146.00	166.00	181.00	205.80
77.00	87.55	112.00	127.34	147.00	167.14	182.00	206.93
78.00	88.69	113.00	128.48	148.00	168.28	183.00	208.07
79.00	89.82	114.00	129.62	149.00	169.41	184.00	209.21
80.00	90.96	115.00	130.76	150.00	170.55	185.00	210.35
81.00	92.10	116.00	131.89	151.00	171.69	186.00	211.48
82.00	93.23	117.00	133.03	152.00	172.82	187.00	212.62
83.00	94.35	118.00	134.17	153.00	173.96	188.00	213.76
84.00	95.51	119.00	135.30	154.00	175.10	189.00	214.89
85.00	96.65	120.00	136.44	155.00	176.24	190.00	216.03
86.00	97.78	121.00	137.56	156.00	177.37	191.00	217.17
87.00	98.92	122.00	138.71	157.00	178.51	192.00	218.30
88.00	100.06	123.00	139.85	158.00	179.65	193.00	219.44
89.00	101.19	124.00	140.99	159.00	180.78	194.00	220.58
90.00	102.33	125.00	142.13	160.00	181.92	195.00	221.72
91.00	103.47	126.00	143.26	161.00	183.06	196.00	222.85
92.00	104.60	127.00	144.40	162.00	184.19	197.00	223.99
93.00	105.74	128.00	145.54	163.00	185.33	198.00	225.13
94.00	106.88	129.00	146.67	164.00	186.47	199.00	226.26
95.00	108.02	130.00	147.81	165.00	187.61	200.00	227.40
96.00	109.15	131.00	148.95	166.00	188.74	201.00	228.54
97.00	110.29	132.00	150.08	167.00	189.88	202.00	229.67
98.00	111.43	133.00	151.22	168.00	191.02	203.00	230.81
99.00	112.56	134.00	152.36	169.00	192.15	204.00	231.95
100.00	113.70	135.00	153.50	170.00	193.29	205.00	233.09

*Roman Scruples to Grams*

99

206.00—28800

234.22—32745

<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Pounds</i>	<i>Grams</i>
206.00	234.22	238.00	270.61	269.00		305.85
207.00	235.36	239.00	271.74	270.00		306.99
208.00	236.50	240.00	272.88	271.00		308.13
209.00	237.63	241.00	274.02	272.00		309.26
210.00	238.77	242.00	275.15	273.00		310.40
211.00	239.91	243.00	276.29	274.00		311.54
212.00	241.04	244.00	277.43	275.00		312.68
213.00	242.18	245.00	278.57	276.00		313.81
214.00	243.32	246.00	279.70	277.00		314.95
215.00	244.46	247.00	280.84	278.00		316.09
216.00	245.59	248.00	281.98	279.00		317.22
217.00	246.73	249.00	283.11	280.00		318.36
218.00	247.87	250.00	284.25	281.00		319.50
219.00	249.00	251.00	285.39	282.00		320.63
220.00	250.14	252.00	286.52	283.00		321.77
221.00	251.28	253.00	287.66	284.00		322.91
222.00	252.41	254.00	288.80	285.00		324.05
223.00	253.55	255.00	289.94	286.00		325.18
224.00	254.69	256.00	291.07	287.00		326.32
225.00	255.83	257.00	292.21	288.00	1	327.45
226.00	256.96	258.00	293.35	576.00	2	654.90
227.00	258.10	259.00	294.48	864.00	3	982.35
228.00	259.24	260.00	295.62	1152.00	4	1309.80
229.00	260.37	261.00	296.76	1440.00	5	1637.25
230.00	261.51	262.00	297.89	2880.0	10	3274.5
231.00	262.65	263.00	299.03	4320.0	15	4911.8
232.00	263.78	264.00	300.17	5760.0	20	6549.0
233.00	264.92	265.00	301.31	8640.0	30	9823.5
234.00	266.06	266.00	302.44	11520	40	13980
235.00	267.20	267.00	303.58	14400	50	16373
236.00	268.33	268.00	304.72	28800	100	32745
237.00	269.47					

TABLE VII  
GRAMS TO ROMAN SCRUPLES

0.10—91.00

0.09—80.03

<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>
0.10	0.09	17.00	14.95	42.00	36.94	67.00	58.93
0.20	0.18	18.00	15.83	43.00	37.82	68.00	59.81
0.30	0.26	19.00	16.71	44.00	38.70	69.00	60.69
0.40	0.35	20.00	17.59	45.00	39.58	70.00	61.57
0.50	0.44	21.00	18.47	46.00	40.46	71.00	62.44
0.60	0.53	22.00	19.35	47.00	41.34	72.00	63.32
0.70	0.62	23.00	20.23	48.00	42.22	73.00	64.20
0.80	0.70	24.00	21.11	49.00	43.10	74.00	65.08
0.90	0.79	25.00	21.99	50.00	43.98	75.00	65.96
1.00	0.88	26.00	22.87	51.00	44.85	76.00	66.84
2.00	1.76	27.00	23.75	52.00	45.73	77.00	67.72
3.00	2.64	28.00	24.63	53.00	46.61	78.00	68.60
4.00	3.52	29.00	25.51	54.00	47.49	79.00	69.48
5.00	4.40	30.00	26.39	55.00	48.37	80.00	70.36
6.00	5.28	31.00	27.26	56.00	49.25	81.00	71.24
7.00	6.16	32.00	28.14	57.00	50.13	82.00	72.12
8.00	7.04	33.00	29.02	58.00	51.01	83.00	73.00
9.00	7.92	34.00	29.90	59.00	51.89	84.00	73.88
10.00	8.80	35.00	30.78	60.00	52.77	85.00	74.76
11.00	9.67	36.00	31.66	61.00	53.65	86.00	75.64
12.00	10.55	37.00	32.54	62.00	54.53	87.00	76.52
13.00	11.43	38.00	33.42	63.00	55.41	88.00	77.40
14.00	12.31	39.00	34.30	64.00	56.29	89.00	78.28
15.00	13.19	40.00	35.18	65.00	57.17	90.00	79.16
16.00	14.07	41.00	36.06	66.00	58.05	91.00	80.03

*Grams to Roman Scruples*

101

92.00—231.00

80.91—203.16

<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>
92.00	80.91	127.00	111.70	162.00	142.48	197.00	173.26
93.00	81.79	128.00	112.58	163.00	143.36	198.00	174.14
94.00	82.67	129.00	113.46	164.00	144.24	199.00	175.02
95.00	83.55	130.00	114.34	165.00	145.12	200.00	175.90
96.00	84.43	131.00	115.21	166.00	146.00	201.00	176.78
97.00	85.31	132.00	116.09	167.00	146.88	202.00	177.66
98.00	86.19	133.00	116.97	168.00	147.76	203.00	178.54
99.00	87.07	134.00	117.85	169.00	148.64	204.00	179.42
100.00	87.95	135.00	118.73	170.00	149.52	205.00	180.30
101.00	88.83	136.00	119.61	171.00	150.39	206.00	181.18
102.00	89.71	137.00	120.49	172.00	151.27	207.00	182.06
103.00	90.59	138.00	121.37	173.00	152.15	208.00	182.94
104.00	91.47	139.00	122.25	174.00	153.03	209.00	183.82
105.00	92.35	140.00	123.13	175.00	153.91	210.00	184.70
106.00	93.23	141.00	124.01	176.00	154.79	211.00	185.57
107.00	94.11	142.00	124.89	177.00	155.67	212.00	186.45
108.00	94.99	143.00	125.77	178.00	156.55	213.00	187.33
109.00	95.87	144.00	126.65	179.00	157.43	214.00	188.21
110.00	96.75	145.00	127.53	180.00	158.31	215.00	189.09
111.00	97.62	146.00	128.41	181.00	159.19	216.00	189.97
112.00	98.50	147.00	129.29	182.00	160.07	217.00	190.85
113.00	99.38	148.00	130.17	183.00	160.95	218.00	191.73
114.00	100.26	149.00	131.05	184.00	161.83	219.00	192.61
115.00	101.14	150.00	131.93	185.00	162.71	220.00	193.49
116.00	102.02	151.00	132.80	186.00	163.59	221.00	194.37
117.00	102.90	152.00	133.68	187.00	164.47	222.00	195.25
118.00	103.78	153.00	134.56	188.00	165.35	223.00	196.13
119.00	104.66	154.00	135.44	189.00	166.23	224.00	197.01
120.00	105.54	155.00	136.32	190.00	167.11	225.00	197.89
121.00	106.42	156.00	137.20	191.00	167.98	226.00	198.77
122.00	107.30	157.00	138.08	192.00	168.86	227.00	199.65
123.00	108.18	158.00	138.96	193.00	169.74	228.00	200.53
124.00	109.06	159.00	139.84	194.00	170.62	229.00	201.41
125.00	109.94	160.00	140.72	195.00	171.50	230.00	202.29
126.00	110.82	161.00	141.60	196.00	172.38	231.00	203.16

232.00—333.00

204.04—292.87

<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>	<i>Grams</i>	<i>Scruples</i>
232.00	204.04	258.00	226.91	284.00	249.78	309.00	271.77
233.00	204.92	259.00	227.79	285.00	250.66	310.00	272.65
234.00	205.80	260.00	228.67	286.00	251.54	311.00	273.52
235.00	206.68	261.00	229.55	287.00	252.42	312.00	274.40
236.00	207.56	262.00	230.43	288.00	253.30	313.00	275.28
237.00	208.44	263.00	231.31	289.00	254.18	314.00	276.16
238.00	209.32	264.00	232.19	290.00	255.06	315.00	277.04
239.00	210.20	265.00	233.07	291.00	255.93	316.00	277.72
240.00	211.08	266.00	233.95	292.00	256.81	317.00	278.80
241.00	211.96	267.00	234.83	293.00	257.69	318.00	279.68
242.00	212.84	268.00	235.71	294.00	258.57	319.00	280.56
243.00	213.72	269.00	236.59	295.00	259.45	320.00	281.44
244.00	214.60	270.00	237.47	296.00	260.33	321.00	282.32
245.00	215.48	271.00	238.34	297.00	261.21	322.00	283.20
246.00	216.36	272.00	239.22	298.00	262.09	323.00	284.08
247.00	217.24	273.00	240.10	299.00	262.97	324.00	284.96
248.00	218.12	274.00	240.98	300.00	263.85	325.00	285.84
249.00	219.00	275.00	241.86	301.00	264.73	326.00	286.72
250.00	219.88	276.00	242.74	302.00	265.61	327.00	287.60
251.00	220.75	277.00	243.62	303.00	266.49	328.00	288.48
252.00	221.63	278.00	244.50	304.00	267.37	329.00	289.36
253.00	222.51	279.00	245.38	305.00	268.25	330.00	290.24
254.00	223.39	280.00	246.26	306.00	269.13	331.00	291.11
255.00	224.27	281.00	247.14	307.00	270.01	332.00	291.99
256.00	225.15	282.00	248.02	308.00	270.89	333.00	292.87
257.00	226.03	283.00	248.90				

TABLE VIII  
GRAMS TO ROMAN CARATS

0.10—10.00

0.5—52.8

<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>
0.10	0.5	2.60	13.7	5.10	26.9	7.60	40.1
0.20	1.1	2.70	14.2	5.20	27.4	7.70	40.6
0.30	1.6	2.80	14.8	5.30	28.0	7.80	41.2
0.40	2.1	2.90	15.3	5.40	28.5	7.90	41.7
0.50	2.6	3.00	15.8	5.50	29.0	8.00	42.2
0.60	3.2	3.10	16.4	5.60	29.6	8.10	42.7
0.70	3.7	3.20	16.9	5.70	30.1	8.20	43.3
0.80	4.2	3.30	17.4	5.80	30.6	8.30	43.8
0.90	4.7	3.40	17.9	5.90	31.1	8.40	44.3
1.00	5.3	3.50	18.5	6.00	31.7	8.50	44.9
1.10	5.8	3.60	19.0	6.10	32.2	8.60	45.4
1.20	6.3	3.70	19.5	6.20	32.7	8.70	45.9
1.30	6.9	3.80	20.0	6.30	33.2	8.80	46.4
1.40	7.4	3.90	20.5	6.40	33.8	8.90	47.0
1.50	7.9	4.00	21.1	6.50	34.3	9.00	47.5
1.60	8.4	4.10	21.6	6.60	34.8	9.10	48.0
1.70	9.0	4.20	22.2	6.70	35.4	9.20	48.5
1.80	9.5	4.30	22.7	6.80	35.9	9.30	49.1
1.90	10.0	4.40	23.2	6.90	36.4	9.40	49.6
2.00	10.6	4.50	23.7	7.00	36.9	9.50	50.1
2.10	11.1	4.60	24.3	7.10	37.5	9.60	50.7
2.20	11.6	4.70	24.8	7.20	38.0	9.70	51.2
2.30	12.1	4.80	25.3	7.30	38.5	9.80	51.7
2.40	12.7	4.90	25.9	7.40	39.0	9.90	52.2
2.50	13.2	5.00	26.4	7.50	39.6	10.00	52.8

<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>
10.10	53.3	13.60	71.8	17.10	90.2	20.60	108.7
10.20	53.8	13.70	72.3	17.20	90.8	20.70	109.2
10.30	54.4	13.80	72.8	17.30	91.3	20.80	109.8
10.40	54.9	13.90	73.4	17.40	91.8	20.90	110.3
10.50	55.4	14.00	73.9	17.50	92.3	21.00	110.8
10.60	55.9	14.10	74.4	17.60	92.9	21.10	111.3
10.70	56.5	14.20	74.9	17.70	93.4	21.20	111.9
10.80	57.0	14.30	75.5	17.80	93.9	21.30	112.4
10.90	57.5	14.40	76.0	17.90	94.4	21.40	112.9
11.00	58.0	14.50	76.5	18.00	95.0	21.50	113.4
11.10	58.6	14.60	77.0	18.10	95.5	21.60	114.0
11.20	59.1	14.70	77.6	18.20	96.0	21.70	114.5
11.30	59.6	14.80	78.1	18.30	96.6	21.80	115.0
11.40	60.1	14.90	78.6	18.40	97.1	21.90	115.6
11.50	60.6	15.00	79.2	18.50	97.6	22.00	116.1
11.60	61.2	15.10	79.7	18.60	98.2	22.10	116.6
11.70	61.7	15.20	80.2	18.70	98.7	22.20	117.1
11.80	62.3	15.30	80.7	18.80	99.2	22.30	117.7
11.90	62.8	15.40	81.3	18.90	99.7	22.40	118.2
12.00	63.3	15.50	81.8	19.00	100.3	22.50	118.7
12.10	63.9	15.60	82.3	19.10	100.8	22.60	119.3
12.20	64.4	15.70	82.8	19.20	101.3	22.70	119.8
12.30	64.9	15.80	83.4	19.30	101.8	22.80	120.3
12.40	65.4	15.90	83.9	19.40	102.4	22.90	120.8
12.50	66.0	16.00	84.4	19.50	102.9	23.00	121.4
12.60	66.5	16.10	85.0	19.60	103.4	23.10	121.9
12.70	67.0	16.20	85.5	19.70	104.0	23.20	122.4
12.80	67.5	16.30	86.0	19.80	104.5	23.30	123.0
12.90	68.1	16.40	86.5	19.90	105.0	23.40	123.5
13.00	68.6	16.50	87.1	20.00	105.5	23.50	124.0
13.10	69.1	16.60	87.6	20.10	106.1	23.60	124.5
13.20	69.7	16.70	88.1	20.20	106.6	23.70	125.1
13.30	70.2	16.80	88.7	20.30	107.1	23.80	125.6
13.40	70.7	16.90	89.2	20.40	107.6	23.90	126.1
13.50	71.2	17.00	89.7	20.50	108.2	24.00	126.6

*Grams to Roman Carats*

105

24.10—38.00

127.2—200.5

<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>
24.10	127.2	27.60	145.6	31.10	164.1	34.60	182.6
24.20	127.7	27.70	146.2	31.20	164.6	34.70	183.1
24.30	128.2	27.80	146.7	31.30	165.2	34.80	183.6
24.40	128.8	27.90	147.2	31.40	165.7	34.90	184.2
24.50	129.3	28.00	147.8	31.50	166.2	35.00	184.7
24.60	129.8	28.10	148.3	31.60	166.8	35.10	185.2
24.70	130.3	28.20	148.8	31.70	167.3	35.20	185.8
24.80	130.9	28.30	149.3	31.80	167.8	35.30	186.3
24.90	131.4	28.40	149.9	31.90	168.3	35.40	186.8
25.00	131.9	28.50	150.4	32.00	168.9	35.50	187.3
25.10	132.4	28.60	150.9	32.10	169.4	35.60	187.9
25.20	133.0	28.70	151.4	32.20	169.9	35.70	188.4
25.30	133.5	28.80	152.0	32.30	170.4	35.80	188.9
25.40	134.0	28.90	152.5	32.40	171.0	35.90	189.4
25.50	134.6	29.00	153.0	32.50	171.5	36.00	190.0
25.60	135.1	29.10	153.6	32.60	172.0	36.10	190.5
25.70	135.6	29.20	154.1	32.70	172.6	36.20	191.0
25.80	136.1	29.30	154.6	32.80	173.1	36.30	191.6
25.90	136.7	29.40	155.1	32.90	173.6	36.40	192.1
26.00	137.2	29.50	155.7	33.00	174.1	36.50	192.6
26.10	137.7	29.60	156.2	33.10	174.7	36.60	193.1
26.20	138.3	29.70	156.7	33.20	175.2	36.70	193.7
26.30	138.8	29.80	157.3	33.30	175.7	36.80	194.2
26.40	139.3	29.90	157.8	33.40	176.3	36.90	194.7
26.50	139.8	30.00	158.3	33.50	176.8	37.00	195.2
26.60	140.4	30.10	158.8	33.60	177.3	37.10	195.8
26.70	140.9	30.20	159.4	33.70	177.8	37.20	196.3
26.80	141.4	30.30	159.9	33.80	178.4	37.30	196.8
26.90	142.0	30.40	160.4	33.90	178.9	37.40	197.4
27.00	142.5	30.50	160.9	34.00	179.4	37.50	197.9
27.10	143.0	30.60	161.5	34.10	179.9	37.60	198.4
27.20	143.5	30.70	162.0	34.20	180.5	37.70	198.9
27.30	144.1	30.80	162.5	34.30	181.0	37.80	199.5
27.40	144.6	30.90	163.1	34.40	181.5	37.90	200.0
27.50	145.1	31.00	163.6	34.50	182.1	38.00	200.5



38.10—50.00

201.1—263.9

<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>	<i>Grams</i>	<i>Carats</i>
38.10	201.1	41.10	216.9	44.10	232.7	47.10	248.5
38.20	201.6	41.20	217.4	44.20	233.2	47.20	249.1
38.30	202.1	41.30	217.9	44.30	233.8	47.30	249.6
38.40	202.6	41.40	218.5	44.40	234.3	47.40	250.1
38.50	203.2	41.50	219.0	44.50	234.8	47.50	250.7
38.60	203.7	41.60	219.5	44.60	235.4	47.60	251.2
38.70	204.2	41.70	220.1	44.70	235.9	47.70	251.7
38.80	204.7	41.80	220.6	44.80	236.4	47.80	252.2
38.90	205.3	41.90	221.1	44.90	236.9	47.90	252.8
39.00	205.8	42.00	221.6	45.00	237.4	48.00	253.3
39.10	206.3	42.10	222.2	45.10	238.0	48.10	253.8
39.20	206.9	42.20	222.7	45.20	238.5	48.20	254.4
39.30	207.4	42.30	223.2	45.30	239.0	48.30	254.9
39.40	207.9	42.40	223.7	45.40	239.6	48.40	255.4
39.50	208.4	42.50	224.3	45.50	240.1	48.50	255.9
39.60	209.0	42.60	224.8	45.60	240.6	48.60	256.5
39.70	209.5	42.70	225.3	45.70	241.2	48.70	257.0
39.80	210.0	42.80	225.9	45.80	241.7	48.80	257.5
39.90	210.6	42.90	226.4	45.90	242.2	48.90	258.0
40.00	211.1	43.00	226.9	46.00	242.7	49.00	258.6
40.10	211.6	43.10	227.4	46.10	243.3	49.10	259.1
40.20	212.1	43.20	228.0	46.20	243.8	49.20	259.6
40.30	212.7	43.30	228.5	46.30	244.3	49.30	260.2
40.40	213.2	43.40	229.0	46.40	244.9	49.40	260.7
40.50	213.7	43.50	229.5	46.50	245.4	49.50	261.2
40.60	214.2	43.60	230.1	46.60	245.9	49.60	261.7
40.70	214.8	43.70	230.6	46.70	246.4	49.70	262.3
40.80	215.3	43.80	231.1	46.80	247.0	49.80	262.8
40.90	215.8	43.90	231.7	46.90	247.5	49.90	263.3
41.00	216.4	44.00	232.2	47.00	248.0	50.00	263.9

TABLE IX  
DECIMAL INCHES TO MILLIMETERS

0.01—1.00

0.3—25.4

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
0.01	0.3	0.26	6.6	0.51	13.0	0.76	19.3
0.02	0.5	0.27	6.9	0.52	13.2	0.77	19.6
0.03	0.8	0.28	7.1	0.53	13.5	0.78	19.8
0.04	1.0	0.29	7.4	0.54	13.7	0.79	20.1
0.05	1.3	0.30	7.6	0.55	14.0	0.80	20.3
0.06	1.5	0.31	7.9	0.56	14.2	0.81	20.6
0.07	1.8	0.32	8.1	0.57	14.5	0.82	20.8
0.08	2.0	0.33	8.4	0.58	14.7	0.83	21.1
0.09	2.3	0.34	8.6	0.59	15.0	0.84	21.3
0.10	2.5	0.35	8.9	0.60	15.2	0.85	21.6
0.11	2.8	0.36	9.1	0.61	15.5	0.86	21.8
0.12	3.1	0.37	9.4	0.62	15.8	0.87	22.1
0.13	3.3	0.38	9.7	0.63	16.0	0.88	22.4
0.14	3.6	0.39	9.9	0.64	16.3	0.89	22.6
0.15	3.8	0.40	10.2	0.65	16.5	0.90	22.9
0.16	4.1	0.41	10.4	0.66	16.8	0.91	23.1
0.17	4.3	0.42	10.7	0.67	17.0	0.92	23.4
0.18	4.6	0.43	10.9	0.68	17.3	0.93	23.6
0.19	4.8	0.44	11.2	0.69	17.5	0.94	23.9
0.20	5.1	0.45	11.4	0.70	17.8	0.95	24.1
0.21	5.3	0.46	11.7	0.71	18.0	0.96	24.4
0.22	5.6	0.47	11.9	0.72	18.3	0.97	24.6
0.23	5.8	0.48	12.2	0.73	18.5	0.98	24.9
0.24	6.1	0.49	12.5	0.74	18.8	0.99	25.2
0.25	6.4	0.50	12.7	0.75	19.1	1.00	25.4

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
1.01	25.7	1.36	34.5	1.71	43.4	2.06	52.3
1.02	25.9	1.37	34.8	1.72	43.7	2.07	52.6
1.03	26.2	1.38	35.1	1.73	43.9	2.08	52.8
1.04	26.4	1.39	35.3	1.74	44.2	2.09	53.1
1.05	26.7	1.40	35.6	1.75	44.5	2.10	53.3
1.06	26.9	1.41	35.8	1.76	44.7	2.11	53.6
1.07	27.2	1.42	36.1	1.77	45.0	2.12	53.9
1.08	27.4	1.43	36.3	1.78	45.2	2.13	54.1
1.09	27.7	1.44	36.6	1.79	45.5	2.14	54.4
1.10	27.9	1.45	36.8	1.80	45.7	2.15	54.6
1.11	28.2	1.46	37.1	1.81	46.0	2.16	54.9
1.12	28.5	1.47	37.3	1.82	46.2	2.17	55.1
1.13	28.7	1.48	37.6	1.83	46.5	2.18	55.4
1.14	29.0	1.49	37.9	1.84	46.7	2.19	55.6
1.15	29.2	1.50	38.1	1.85	47.0	2.20	55.9
1.16	29.5	1.51	38.4	1.86	47.2	2.21	56.1
1.17	29.7	1.52	38.6	1.87	47.5	2.22	56.4
1.18	30.0	1.53	38.9	1.88	47.8	2.23	56.6
1.19	30.2	1.54	39.1	1.89	48.0	2.24	56.9
1.20	30.5	1.55	39.4	1.90	48.3	2.25	57.2
1.21	30.7	1.56	39.6	1.91	48.5	2.26	57.4
1.22	31.0	1.57	39.9	1.92	48.8	2.27	57.7
1.23	31.2	1.58	40.1	1.93	49.0	2.28	57.9
1.24	31.5	1.59	40.4	1.94	49.3	2.29	58.2
1.25	31.8	1.60	40.6	1.95	49.5	2.30	58.4
1.26	32.0	1.61	40.9	1.96	49.8	2.31	58.7
1.27	32.3	1.62	41.2	1.97	50.0	2.32	58.9
1.28	32.5	1.63	41.4	1.98	50.3	2.33	59.2
1.29	32.8	1.64	41.7	1.99	50.6	2.34	59.4
1.30	33.0	1.65	41.9	2.00	50.8	2.35	59.7
1.31	33.3	1.66	42.2	2.01	51.1	2.36	59.9
1.32	33.5	1.67	42.4	2.02	51.3	2.37	60.2
1.33	33.8	1.68	42.7	2.03	51.6	2.38	60.5
1.34	34.0	1.69	42.9	2.04	51.8	2.39	60.7
1.35	34.3	1.70	43.2	2.05	52.1	2.40	61.0

*Decimal Inches to Millimeters*

109

2.41—3.80

61.2—96.5

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
2.41	61.2	2.76	70.1	3.11	79.0	3.46	87.9
2.42	61.5	2.77	70.4	3.12	79.3	3.47	88.1
2.43	61.7	2.78	70.6	3.13	79.5	3.48	88.4
2.44	62.0	2.79	70.9	3.14	79.8	3.49	88.7
2.45	62.2	2.80	71.1	3.15	80.0	3.50	88.9
2.46	62.5	2.81	71.4	3.16	80.3	3.51	89.2
2.47	62.7	2.82	71.6	3.17	80.5	3.52	89.4
2.48	63.0	2.83	71.9	3.18	80.8	3.53	89.7
2.49	63.3	2.84	72.1	3.19	81.0	3.54	89.9
2.50	63.5	2.85	72.4	3.20	81.3	3.55	90.2
2.51	63.8	2.86	72.6	3.21	81.5	3.56	90.4
2.52	64.0	2.87	72.9	3.22	81.8	3.57	90.7
2.53	64.3	2.88	73.2	3.23	82.0	3.58	90.9
2.54	64.5	2.89	73.4	3.24	82.3	3.59	91.2
2.55	64.8	2.90	73.7	3.25	82.6	3.60	91.4
2.56	65.0	2.91	73.9	3.26	82.8	3.61	91.7
2.57	65.3	2.92	74.2	3.27	83.1	3.62	92.0
2.58	65.5	2.93	74.4	3.28	83.3	3.63	92.2
2.59	65.8	2.94	74.7	3.29	83.6	3.64	92.5
2.60	66.0	2.95	74.9	3.30	83.8	3.65	92.7
2.61	66.3	2.96	75.2	3.31	84.1	3.66	93.0
2.62	66.6	2.97	75.4	3.32	84.3	3.67	93.2
2.63	66.8	2.98	75.7	3.33	84.6	3.68	93.5
2.64	67.1	2.99	76.0	3.34	84.8	3.69	93.7
2.65	67.3	3.00	76.2	3.35	85.1	3.70	94.0
2.66	67.6	3.01	76.5	3.36	85.3	3.71	94.2
2.67	67.8	3.02	76.7	3.37	85.6	3.72	94.5
2.68	68.1	3.03	77.0	3.38	85.9	3.73	94.7
2.69	68.3	3.04	77.2	3.39	86.1	3.74	95.0
2.70	68.6	3.05	77.5	3.40	86.4	3.75	95.3
2.71	68.8	3.06	77.7	3.41	86.6	3.76	95.5
2.72	69.1	3.07	78.0	3.42	86.9	3.77	95.8
2.73	69.3	3.08	78.2	3.43	87.1	3.78	96.0
2.74	69.6	3.09	78.5	3.44	87.4	3.79	96.3
2.75	69.9	3.10	78.7	3.45	87.6	3.80	96.5

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
3.81	96.8	4.16	105.7	4.51	114.6	4.86	123.4
3.82	97.0	4.17	105.9	4.52	114.8	4.87	123.7
3.83	97.3	4.18	106.2	4.53	115.1	4.88	124.0
3.84	97.5	4.19	106.4	4.54	115.3	4.89	124.2
3.85	97.8	4.20	106.7	4.55	115.6	4.90	124.5
3.86	98.0	4.21	106.9	4.56	115.8	4.91	124.7
3.87	98.3	4.22	107.2	4.57	116.1	4.92	125.0
3.88	98.6	4.23	107.4	4.58	116.3	4.93	125.2
3.89	98.8	4.24	107.7	4.59	116.6	4.94	125.5
3.90	99.1	4.25	108.0	4.60	116.8	4.95	125.7
3.91	99.3	4.26	108.2	4.61	117.1	4.96	126.0
3.92	99.6	4.27	108.5	4.62	117.4	4.97	126.2
3.93	99.8	4.28	108.7	4.63	117.6	4.98	126.5
3.94	100.1	4.29	109.0	4.64	117.9	4.99	126.8
3.95	100.3	4.30	109.2	4.65	118.1	5.00	127.0
3.96	100.6	4.31	109.5	4.66	118.4	5.01	127.3
3.97	100.8	4.32	109.7	4.67	118.6	5.02	127.5
3.98	101.1	4.33	110.0	4.68	118.9	5.03	127.8
3.99	101.4	4.34	110.2	4.69	119.1	5.04	128.0
4.00	101.6	4.35	110.5	4.70	119.4	5.05	128.3
4.01	101.9	4.36	110.7	4.71	119.6	5.06	128.5
4.02	102.1	4.37	111.0	4.72	119.9	5.07	128.8
4.03	102.4	4.38	111.3	4.73	120.1	5.08	129.0
4.04	102.6	4.39	111.5	4.74	120.4	5.09	129.3
4.05	102.9	4.40	111.8	4.75	120.7	5.10	129.5
4.06	103.1	4.41	112.0	4.76	120.9	5.11	129.8
4.07	103.4	4.42	112.3	4.77	121.2	5.12	130.1
4.08	103.6	4.43	112.5	4.78	121.4	5.13	130.3
4.09	103.9	4.44	112.8	4.79	121.7	5.14	130.6
4.10	104.1	4.45	113.0	4.80	121.9	5.15	130.8
4.11	104.4	4.46	113.3	4.81	122.2	5.16	131.1
4.12	104.7	4.47	113.5	4.82	122.4	5.17	131.3
4.13	104.9	4.48	113.8	4.83	122.7	5.18	131.6
4.14	105.2	4.49	114.0	4.84	122.9	5.19	131.8
4.15	105.4	4.50	114.3	4.85	123.2	5.20	132.1

*Decimal Inches to Millimeters*

III

5.21—6.00

132.3—152.4

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
5.21	132.3	5.41	137.4	5.61	142.5	5.81	147.6
5.22	132.6	5.42	137.7	5.62	142.8	5.82	147.8
5.23	132.8	5.43	137.9	5.63	143.0	5.83	148.1
5.24	133.1	5.44	138.2	5.64	143.3	5.84	148.3
5.25	133.4	5.45	138.4	5.65	143.5	5.85	148.6
5.26	133.6	5.46	138.7	5.66	143.8	5.86	148.8
5.27	133.9	5.47	138.9	5.67	144.0	5.87	149.1
5.28	134.1	5.48	139.2	5.68	144.3	5.88	149.4
5.29	134.4	5.49	139.5	5.69	144.5	5.89	149.6
5.30	134.6	5.50	139.7	5.70	144.8	5.90	149.9
5.31	134.9	5.51	140.0	5.71	145.0	5.91	150.1
5.32	135.1	5.52	140.2	5.72	145.3	5.92	150.4
5.33	135.4	5.53	140.5	5.73	145.5	5.93	150.6
5.34	135.6	5.54	140.7	5.74	145.8	5.94	150.9
5.35	135.9	5.55	141.0	5.75	146.1	5.95	151.1
5.36	136.1	5.56	141.2	5.76	146.3	5.96	151.4
5.37	136.4	5.57	141.5	5.77	146.6	5.97	151.6
5.38	136.7	5.58	141.7	5.78	146.8	5.98	151.9
5.39	136.9	5.59	142.0	5.79	147.1	5.99	152.2
5.40	137.2	5.60	142.2	5.80	147.3	6.00	152.4

TABLE X  
FRACTIONAL INCHES TO MILLIMETERS

$\frac{1}{64}$ — $1\frac{1}{4}$

0.4—31.8

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
$\frac{1}{64}$	0.4	$\frac{21}{64}$	8.3	$\frac{41}{64}$	16.3	$\frac{61}{64}$	24.2
$\frac{1}{32}$	0.8	$\frac{11}{32}$	8.7	$\frac{21}{32}$	16.7	$\frac{31}{32}$	24.6
$\frac{3}{64}$	1.2	$\frac{23}{64}$	9.1	$\frac{43}{64}$	17.1	$\frac{63}{64}$	25.0
$\frac{1}{16}$	1.6	$\frac{3}{8}$	9.5	$\frac{11}{16}$	17.5	I	25.4
$\frac{5}{64}$	2.0	$\frac{25}{64}$	9.9	$\frac{45}{64}$	17.9	I $\frac{1}{64}$	25.8
$\frac{3}{32}$	2.4	$\frac{13}{32}$	10.3	$\frac{23}{32}$	18.3	I $\frac{1}{32}$	26.2
$\frac{7}{64}$	2.8	$\frac{27}{64}$	10.7	$\frac{47}{64}$	18.7	I $\frac{3}{64}$	26.6
$\frac{1}{8}$	3.2	$\frac{7}{16}$	11.1	$\frac{3}{4}$	19.1	I $\frac{1}{16}$	27.0
$\frac{9}{64}$	3.6	$\frac{29}{64}$	11.5	$\frac{49}{64}$	19.5	I $\frac{5}{64}$	27.4
$\frac{5}{32}$	4.0	$\frac{15}{32}$	11.9	$\frac{25}{32}$	19.8	I $\frac{3}{32}$	27.8
$\frac{11}{64}$	4.4	$\frac{31}{64}$	12.3	$\frac{51}{64}$	20.2	I $\frac{7}{64}$	28.2
$\frac{3}{16}$	4.8	$\frac{1}{2}$	12.7	$\frac{13}{16}$	20.6	I $\frac{1}{8}$	28.6
$\frac{13}{64}$	5.2	$\frac{33}{64}$	13.1	$\frac{53}{64}$	21.0	I $\frac{9}{64}$	29.0
$\frac{7}{32}$	5.6	$\frac{17}{32}$	13.5	$\frac{27}{32}$	21.4	I $\frac{5}{32}$	29.4
$\frac{15}{64}$	6.0	$\frac{35}{64}$	13.9	$\frac{55}{64}$	21.8	I $\frac{11}{16}$	29.8
$\frac{1}{4}$	6.4	$\frac{9}{16}$	14.3	$\frac{7}{8}$	22.2	I $\frac{3}{16}$	30.2
$\frac{17}{64}$	6.8	$\frac{37}{64}$	14.7	$\frac{57}{64}$	22.6	I $\frac{13}{64}$	30.6
$\frac{9}{32}$	7.1	$\frac{19}{32}$	15.1	$\frac{29}{32}$	23.0	I $\frac{7}{32}$	31.0
$\frac{19}{64}$	7.5	$\frac{39}{64}$	15.5	$\frac{59}{64}$	23.4	I $\frac{15}{64}$	31.4
$\frac{5}{16}$	7.9	$\frac{5}{8}$	15.9	$\frac{15}{16}$	23.8	I $\frac{1}{4}$	31.8

Fractional Inches to Millimeters

113

$1\frac{17}{64}$ —3

32.2—76.2

In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.
$1\frac{17}{64}$	32.2	$1\frac{45}{64}$	43.3	$2\frac{9}{64}$	54.4	$2\frac{37}{64}$	65.5
$1\frac{9}{32}$	32.5	$1\frac{23}{32}$	43.7	$2\frac{5}{32}$	54.8	$2\frac{19}{32}$	65.9
$1\frac{19}{64}$	32.9	$1\frac{47}{64}$	44.1	$2\frac{11}{64}$	55.2	$2\frac{39}{64}$	66.3
$1\frac{5}{16}$	33.3	$1\frac{3}{4}$	44.5	$2\frac{3}{16}$	55.6	$2\frac{5}{8}$	66.7
$1\frac{21}{64}$	33.7	$1\frac{49}{64}$	44.9	$2\frac{13}{64}$	56.0	$2\frac{41}{64}$	67.1
$1\frac{11}{32}$	34.1	$1\frac{25}{32}$	45.2	$2\frac{7}{32}$	56.4	$2\frac{21}{32}$	67.5
$1\frac{23}{64}$	34.5	$1\frac{51}{64}$	45.6	$2\frac{15}{64}$	56.8	$2\frac{43}{64}$	67.9
$1\frac{3}{8}$	34.9	$1\frac{13}{16}$	46.0	$2\frac{1}{4}$	57.2	$2\frac{11}{16}$	68.3
$1\frac{25}{64}$	35.5	$1\frac{53}{64}$	46.4	$2\frac{17}{64}$	57.6	$2\frac{45}{64}$	68.7
$1\frac{13}{32}$	35.7	$1\frac{27}{32}$	46.8	$2\frac{9}{32}$	57.9	$2\frac{23}{32}$	69.1
$1\frac{27}{64}$	36.1	$1\frac{55}{64}$	47.2	$2\frac{19}{64}$	58.3	$2\frac{47}{64}$	69.5
$1\frac{7}{16}$	36.5	$1\frac{7}{8}$	47.6	$2\frac{5}{16}$	58.7	$2\frac{3}{4}$	69.9
$1\frac{29}{64}$	36.9	$1\frac{57}{64}$	48.0	$2\frac{21}{64}$	59.1	$2\frac{49}{64}$	70.3
$1\frac{15}{32}$	37.3	$1\frac{29}{32}$	48.4	$2\frac{11}{32}$	59.5	$2\frac{25}{32}$	70.6
$1\frac{31}{64}$	37.7	$1\frac{59}{64}$	48.8	$2\frac{23}{64}$	59.9	$2\frac{51}{64}$	71.0
$1\frac{1}{2}$	38.1	$1\frac{15}{16}$	49.2	$2\frac{3}{8}$	60.3	$2\frac{13}{16}$	71.4
$1\frac{33}{64}$	38.5	$1\frac{61}{64}$	49.6	$2\frac{25}{64}$	60.7	$2\frac{53}{64}$	71.8
$1\frac{17}{32}$	38.9	$1\frac{31}{32}$	50.0	$2\frac{13}{32}$	61.1	$2\frac{27}{32}$	72.2
$1\frac{35}{64}$	39.3	$1\frac{63}{64}$	50.4	$2\frac{27}{64}$	61.5	$2\frac{55}{64}$	72.6
$1\frac{9}{16}$	39.7	2	50.8	$2\frac{7}{16}$	61.9	$2\frac{7}{8}$	73.0
$1\frac{37}{64}$	40.1	$2\frac{1}{64}$	51.2	$2\frac{29}{64}$	62.3	$2\frac{57}{64}$	73.4
$1\frac{19}{32}$	40.5	$2\frac{1}{32}$	51.6	$2\frac{15}{32}$	62.7	$2\frac{29}{32}$	73.8
$1\frac{39}{64}$	40.9	$2\frac{3}{64}$	52.0	$2\frac{31}{64}$	63.1	$2\frac{59}{64}$	74.2
$1\frac{5}{8}$	41.3	$2\frac{1}{16}$	52.4	$2\frac{1}{2}$	63.5	$2\frac{15}{16}$	74.6
$1\frac{41}{64}$	41.7	$2\frac{5}{64}$	52.8	$2\frac{33}{64}$	63.9	$2\frac{61}{64}$	75.0
$1\frac{21}{32}$	42.1	$2\frac{3}{32}$	53.2	$2\frac{17}{32}$	64.3	$2\frac{31}{32}$	75.4
$1\frac{43}{64}$	42.5	$2\frac{7}{64}$	53.6	$2\frac{35}{64}$	64.7	$2\frac{63}{64}$	75.8
$1\frac{11}{16}$	42.9	$2\frac{1}{8}$	54.0	$2\frac{9}{16}$	65.1	3	76.2



$3\frac{1}{64}-4\frac{3}{4}$ 

76.6—120.7

<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>
$3\frac{1}{64}$	76.6	$3\frac{29}{64}$	87.7	$3\frac{57}{64}$	98.8	$4\frac{21}{64}$	109.9
$3\frac{1}{32}$	77.0	$3\frac{15}{32}$	88.1	$3\frac{29}{32}$	99.2	$4\frac{11}{32}$	110.3
$3\frac{3}{64}$	77.4	$3\frac{31}{64}$	88.5	$3\frac{59}{64}$	99.6	$4\frac{23}{64}$	110.7
$3\frac{1}{16}$	77.8	$3\frac{1}{2}$	88.9	$3\frac{15}{16}$	100.0	$4\frac{3}{8}$	111.1
$3\frac{5}{64}$	78.2	$3\frac{33}{64}$	89.3	$3\frac{61}{64}$	100.4	$4\frac{25}{64}$	111.5
$3\frac{3}{32}$	78.6	$3\frac{17}{32}$	89.7	$3\frac{31}{32}$	100.8	$4\frac{13}{32}$	111.9
$3\frac{7}{64}$	79.0	$3\frac{35}{64}$	90.1	$3\frac{63}{64}$	101.2	$4\frac{27}{64}$	112.3
$3\frac{1}{8}$	79.4	$3\frac{9}{16}$	90.5	4	101.6	$4\frac{7}{16}$	112.7
$3\frac{9}{64}$	79.8	$3\frac{37}{64}$	90.9	$4\frac{1}{64}$	102.0	$4\frac{29}{64}$	113.1
$3\frac{5}{32}$	80.2	$3\frac{19}{32}$	91.3	$4\frac{1}{32}$	102.4	$4\frac{15}{32}$	113.5
$3\frac{11}{64}$	80.6	$3\frac{39}{64}$	91.7	$4\frac{3}{64}$	102.8	$4\frac{31}{64}$	113.9
$3\frac{3}{16}$	81.0	$3\frac{5}{8}$	92.1	$4\frac{1}{16}$	103.2	$4\frac{1}{2}$	114.3
$3\frac{13}{64}$	81.4	$3\frac{41}{64}$	92.5	$4\frac{5}{64}$	103.6	$4\frac{33}{64}$	114.7
$3\frac{7}{32}$	81.8	$3\frac{21}{32}$	92.9	$4\frac{3}{32}$	104.0	$4\frac{17}{32}$	115.1
$3\frac{15}{64}$	82.2	$3\frac{43}{64}$	93.3	$4\frac{7}{64}$	104.4	$4\frac{35}{64}$	115.5
$3\frac{1}{4}$	82.6	$3\frac{11}{16}$	93.7	$4\frac{1}{8}$	104.8	$4\frac{9}{16}$	115.9
$3\frac{17}{64}$	83.0	$3\frac{45}{64}$	94.1	$4\frac{9}{64}$	105.2	$4\frac{37}{64}$	116.3
$3\frac{9}{32}$	83.3	$3\frac{23}{32}$	94.5	$4\frac{5}{32}$	105.6	$4\frac{19}{32}$	116.7
$3\frac{19}{64}$	83.7	$3\frac{47}{64}$	94.9	$4\frac{11}{64}$	106.0	$4\frac{39}{64}$	117.1
$3\frac{5}{16}$	84.1	$3\frac{3}{4}$	95.3	$4\frac{3}{16}$	106.4	$4\frac{5}{8}$	117.5
$3\frac{21}{64}$	84.5	$3\frac{49}{64}$	95.7	$4\frac{13}{64}$	106.8	$4\frac{41}{64}$	117.9
$3\frac{11}{32}$	84.9	$3\frac{25}{32}$	96.0	$4\frac{7}{32}$	107.2	$4\frac{21}{32}$	118.3
$3\frac{23}{64}$	85.3	$3\frac{51}{64}$	96.4	$4\frac{15}{64}$	107.6	$4\frac{43}{64}$	118.7
$3\frac{3}{8}$	85.7	$3\frac{13}{16}$	96.8	$4\frac{1}{4}$	108.0	$4\frac{11}{16}$	119.1
$3\frac{25}{64}$	86.1	$3\frac{53}{64}$	97.2	$4\frac{17}{64}$	108.4	$4\frac{45}{64}$	119.5
$3\frac{13}{32}$	86.5	$3\frac{27}{32}$	97.6	$4\frac{9}{32}$	108.7	$4\frac{23}{32}$	119.9
$3\frac{27}{64}$	86.9	$3\frac{55}{64}$	98.0	$4\frac{19}{64}$	109.1	$4\frac{47}{64}$	120.3
$3\frac{7}{16}$	87.3	$3\frac{7}{8}$	98.4	$4\frac{5}{16}$	109.5	$4\frac{3}{4}$	120.7

# Fractional Inches to Millimeters

115

$4\frac{49}{64}$ —6

121.1—152.4

In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.
$4\frac{49}{64}$	121.1	$5\frac{5}{64}$	129.0	$5\frac{25}{64}$	136.9	$5\frac{45}{64}$	144.9
$4\frac{25}{32}$	121.4	$5\frac{3}{32}$	129.4	$5\frac{13}{32}$	137.3	$5\frac{23}{32}$	145.3
$4\frac{51}{64}$	121.8	$5\frac{7}{64}$	129.8	$5\frac{27}{64}$	137.7	$5\frac{47}{64}$	145.7
$4\frac{13}{16}$	122.2	$5\frac{1}{8}$	130.2	$5\frac{7}{16}$	138.1	$5\frac{3}{4}$	146.1
$4\frac{53}{64}$	122.6	$5\frac{9}{64}$	130.6	$5\frac{29}{64}$	138.5	$5\frac{49}{64}$	146.5
$4\frac{27}{32}$	123.0	$5\frac{5}{32}$	131.0	$5\frac{15}{32}$	138.9	$5\frac{25}{32}$	146.8
$4\frac{55}{64}$	123.4	$5\frac{11}{64}$	131.4	$5\frac{31}{64}$	139.3	$5\frac{51}{64}$	147.2
$4\frac{7}{8}$	123.8	$5\frac{3}{16}$	131.8	$5\frac{1}{2}$	139.7	$5\frac{13}{14}$	147.6
$4\frac{57}{64}$	124.2	$5\frac{13}{64}$	132.2	$5\frac{33}{64}$	140.1	$5\frac{53}{64}$	148.0
$4\frac{29}{32}$	124.6	$5\frac{7}{32}$	132.6	$5\frac{17}{32}$	140.5	$5\frac{27}{32}$	148.4
$4\frac{59}{64}$	125.0	$5\frac{15}{64}$	133.0	$5\frac{35}{64}$	140.9	$5\frac{55}{64}$	148.8
$4\frac{15}{16}$	125.4	$5\frac{1}{4}$	133.4	$5\frac{9}{16}$	141.3	$5\frac{7}{8}$	149.2
$4\frac{61}{64}$	125.8	$5\frac{17}{64}$	133.8	$5\frac{37}{64}$	141.7	$5\frac{57}{64}$	149.6
$4\frac{31}{32}$	126.2	$5\frac{9}{32}$	134.1	$5\frac{19}{32}$	142.1	$5\frac{29}{32}$	150.0
$4\frac{63}{64}$	126.6	$5\frac{19}{64}$	134.5	$5\frac{39}{64}$	142.5	$5\frac{59}{64}$	150.4
5	127.0	$5\frac{5}{16}$	134.9	$5\frac{5}{8}$	142.9	$5\frac{15}{16}$	150.8
$5\frac{1}{64}$	127.4	$5\frac{21}{64}$	135.3	$5\frac{41}{64}$	143.3	$5\frac{61}{64}$	151.2
$5\frac{1}{32}$	127.8	$5\frac{11}{32}$	135.7	$5\frac{21}{32}$	143.7	$5\frac{31}{32}$	151.6
$5\frac{3}{64}$	128.2	$5\frac{23}{64}$	136.1	$5\frac{43}{64}$	144.1	$5\frac{63}{64}$	152.0
$5\frac{1}{16}$	128.6	$5\frac{3}{8}$	136.5	$5\frac{11}{16}$	144.5	6	152.4

TABLE XI  
WHOLE MILLIMETERS TO INCHES

1—75

0.04—2.95

<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>
1	0.04	26	1.02	51	2.01
2	0.08	27	1.06	52	2.05
3	0.12	28	1.10	53	2.09
4	0.16	29	1.14	54	2.13
5	0.20	30	1.18	55	2.17
6	0.24	31	1.22	56	2.21
7	0.28	32	1.26	57	2.24
8	0.32	33	1.30	58	2.28
9	0.35	34	1.34	59	2.32
10	0.39	35	1.38	60	2.36
11	0.43	36	1.42	61	2.40
12	0.47	37	1.46	62	2.44
13	0.51	38	1.50	63	2.48
14	0.55	39	1.54	64	2.52
15	0.59	40	1.58	65	2.56
16	0.63	41	1.61	66	2.60
17	0.67	42	1.65	67	2.64
18	0.71	43	1.69	68	2.68
19	0.75	44	1.73	69	2.72
20	0.79	45	1.77	70	2.76
21	0.83	46	1.81	71	2.80
22	0.87	47	1.85	72	2.84
23	0.91	48	1.89	73	2.87
24	0.95	49	1.93	74	2.91
25	0.98	50	1.97	75	2.95

Whole Millimeters to Inches

117

76—150

2.99—5.91

<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>	<i>Mm.</i>	<i>In.</i>
76	2.99	101	3.98	126	4.96
77	3.03	102	4.02	127	5.00
78	3.07	103	4.06	128	5.04
79	3.11	104	4.10	129	5.08
80	3.15	105	4.13	130	5.12
81	3.19	106	4.17	131	5.16
82	3.23	107	4.21	132	5.20
83	3.27	108	4.25	133	5.24
84	3.31	109	4.29	134	5.28
85	3.35	110	4.33	135	5.32
86	3.39	111	4.37	136	5.35
87	3.43	112	4.41	137	5.39
88	3.47	113	4.45	138	5.43
89	3.50	114	4.49	139	5.47
90	3.54	115	4.53	140	5.51
91	3.58	116	4.57	141	5.55
92	3.62	117	4.61	142	5.59
93	3.66	118	4.65	143	5.63
94	3.70	119	4.69	144	5.67
95	3.74	120	4.72	145	5.71
96	3.78	121	4.76	146	5.75
97	3.82	122	4.80	147	5.79
98	3.86	123	4.84	148	5.83
99	3.90	124	4.88	149	5.87
100	3.94	125	4.92	150	5.91

TABLE XII  
UNITS IN THE *AMERICAN SCALE* TO DECIMAL INCHES  
AND MILLIMETERS

1—75

1.6—119.1

<i>Units</i>	<i>In.</i>	<i>Mm.</i>	<i>Units</i>	<i>In.</i>	<i>Mm.</i>	<i>Units</i>	<i>In.</i>	<i>Mm.</i>
1	0.06	1.6	26	1.63	41.3	51	3.19	81.0
2	0.13	3.2	27	1.69	42.9	52	3.25	82.5
3	0.19	4.8	28	1.75	44.4	53	3.31	84.1
4	0.25	6.4	29	1.81	46.0	54	3.38	85.7
5	0.31	7.9	30	1.88	47.6	55	3.44	87.3
6	0.38	9.5	31	1.94	49.2	56	3.50	88.9
7	0.44	11.1	32	2.00	50.8	57	3.56	90.5
8	0.50	12.7	33	2.06	52.4	58	3.63	92.1
9	0.56	14.3	34	2.13	54.0	59	3.69	93.7
10	0.63	15.9	35	2.19	55.6	60	3.75	95.2
11	0.69	17.5	36	2.25	57.1	61	3.81	96.8
12	0.75	19.1	37	2.31	58.7	62	3.88	98.4
13	0.81	20.6	38	2.38	60.3	63	3.94	100.0
14	0.88	22.2	39	2.44	61.9	64	4.00	101.6
15	0.94	23.8	40	2.50	63.5	65	4.06	103.2
16	1.00	25.4	41	2.56	65.1	66	4.13	104.8
17	1.06	27.0	42	2.63	66.7	67	4.19	106.4
18	1.13	28.6	43	2.69	68.3	68	4.25	108.0
19	1.19	30.2	44	2.75	69.8	69	4.31	109.5
20	1.25	31.7	45	2.81	71.4	70	4.38	111.1
21	1.31	33.3	46	2.88	73.0	71	4.44	112.7
22	1.38	34.9	47	2.94	74.6	72	4.50	114.3
23	1.44	36.5	48	3.00	76.2	73	4.56	115.9
24	1.50	38.1	49	3.06	77.8	74	4.63	117.5
25	1.56	39.7	50	3.13	79.4	75	4.69	119.1

76—100

120.7—158.8

<i>Units</i>	<i>In.</i>	<i>Mm.</i>	<i>Units</i>	<i>In.</i>	<i>Mm.</i>	<i>Units</i>	<i>In.</i>	<i>Mm.</i>
76	4.75	120.7	85	5.31	134.9	93	5.81	147.6
77	4.81	122.2	86	5.38	136.5	94	5.88	149.2
78	4.88	123.8	87	5.44	138.1	95	5.94	150.8
79	4.94	125.4	88	5.50	139.7	96	6.00	152.4
80	5.00	127.0	89	5.56	141.3	97	6.06	154.0
81	5.06	128.6	90	5.63	142.9	98	6.13	155.6
82	5.13	130.2	91	5.69	144.5	99	6.19	157.2
83	5.19	131.8	92	5.75	146.1	100	6.25	158.8
84	5.25	133.4						

TABLE XIII

UNITS IN *MIONNET'S* SCALE TO DECIMAL INCHES AND  
MILLIMETERS

<i>Units</i>	<i>In.</i>	<i>Mm.</i>
1	0.35	9.0
2	0.50	12.5
3	0.60	15.0
4	0.70	18.0
5	0.85	21.5
6	0.95	24.0
7	1.05	26.5
8	1.15	29.0
9	1.25	32.0
10	1.40	35.5
11	1.50	38.0
12	1.60	40.5
13	1.70	43.5
14	2.05	52.0
15	2.25	56.5
16	2.40	61.0
17	2.55	65.0
18	2.80	71.0
19	3.10	78.5

PLATE I

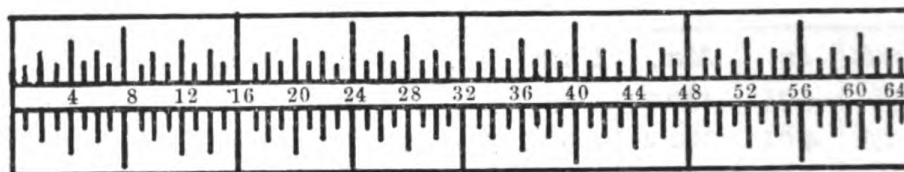


Fig. 1

Reproduction of the *American Scale* according to *Proceedings of the Numismatic and Antiquarian Society of Philadelphia* (1865-1866), Preface, p. 4.

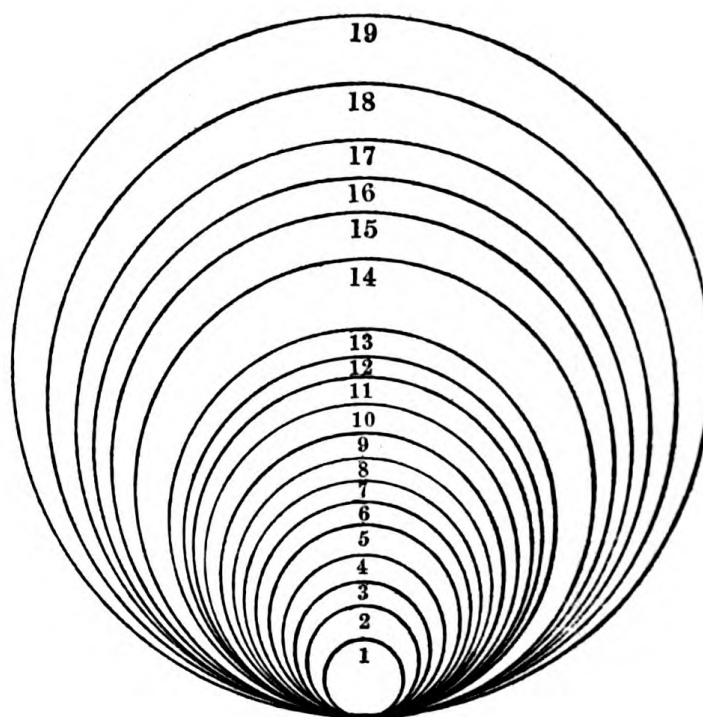


Fig. 2

Reproduction of *Mionnet's Scale* according to Mionnet, T. E., *Description de Medailles Antiques* (Paris, 1805).

## PLATE II

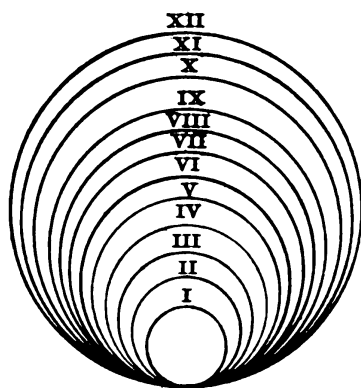


Fig. 1

Reproduction of reduced scale of Mionnet according to Leake, W. M.,  
*Numismata Hellenica* (London, 1856).

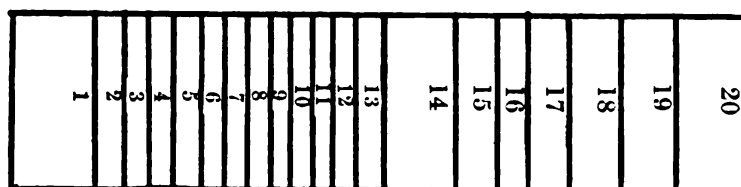


Fig. 2

Reproduction of rectangular form of *Mionnet's Scale* according to  
 Dickeson, *The American Numismatic Manual*  
 (Philadelphia, 1859), p. 30.





















